THE PILOT ARITHMETICS

BOOK TWO

MARSH — VAN SICKLE

NEWSON & COMPANY

1. Discount.
11 selling pr.
11 Profit.
11 Loss.

1. com.
1. Net. pro.
1. Entire cost

Clyde L. Wilkinson Jr.

1, Int

233 Table

1 percent

THE PILOT ARITHMETICS
BOOK TWO

FOR GRADES FIVE AND SIX

BY

HARRY B. MARSH

HEAD OF THE MATHEMATICS DEPARTMENT
THE TECHNICAL HIGH SCHOOL
SPRINGFIELD, MASSACHUSETTS

AND

JAMES H. VAN SICKLE

FORMERLY SUPERINTENDENT OF SCHOOLS
SPRINGFIELD, MASSACHUSETTS

NEWSON & COMPANY
NEW YORK AND CHICAGO

COPYRIGHT, 1923, BY
NEWSON & COMPANY

PRINTED IN U. S. A.

PREFACE

Book Two of The Pilot Arithmetics is for use in Grade Five and Grade Six; Part I being for Grade Five and Part II for Grade Six. The general arrangement of the book is around the main topics of arithmetic. This plan, combined with the introduction of topics of special interest, makes for systematic and orderly progress through subject matter chosen for the purpose of creating and maintaining the interest of pupils.

Throughout the book, the methods and forms of operation chosen are made as simple and as practical as possible. The problems in the early part of the text are based largely on the immediate interests and experiences of the pupils. As the work progresses, it broadens out into wider fields of activity. Operations little used in everyday life are either omitted or treated lightly. In connection with the drills on the four fundamental operations, time tests are given for both Grades Five and Six. Improvement tests are included at the end of Chapters III, VI, IX, and XII.

The approach to each of the three main topics in this book — common fractions, decimal fractions, and percentage — is made easy and natural. The work in fractions is introduced by means of diagrams, with no attempt to give rules at first. After pupils have become somewhat familiar with the meaning and use of fractions, the subject is taken up from a general standpoint. The work in fractions is purposely broken by a chapter on useful measures. Decimal fractions are first studied by taking up tenths and hundredths only. In like manner, the subject of percentage is introduced gradually by means of easy fractional equivalents.

The arrangement of each chapter is worthy of note. Wherever possible, written work is preceded by easy oral exercises which emphasize drill on the principle. In the written work itself the

examples are carefully graded. When the material of the chapter has been presented, there is generally a process review which covers, by a series of carefully worked out questions, all the new principles. The chapters usually end with oral and written reviews and a series of general tests which are both useful in themselves and suggestive of similar tests which teachers may wish to provide for the same purpose. The last chapter is a comprehensive topical review.

The book contains many local problems in which the pupil is expected to furnish his own data. In addition, many special topics of interest to children are taken up, such as: A School Picnic, The Sewing Class, Poultry Raising, The School Playground, Boy Scout Supplies, Taking a Journey, The School Garden, and many others.

The authors desire to acknowledge the very valuable assistance given in the preparation of the manuscript by Miss Lou Belle Stevens, Supervisor of Primary Arithmetic, New Rochelle, New York; Miss Amie M. Billings, formerly Principal of the Kensington Avenue School, Springfield, Mass.; and Miss Elizabeth Brockenbrough, Mathematics Department, Robert E. Lee Junior High School, Richmond, Virginia; and the constructive criticisms and suggestions of Mr. C. Edward Fisher, Superintendent of Schools, Braintree, Mass.; and of Prof. G. M. Wilson of Iowa State College, who reviewed and criticized the entire manuscript.

CONTENTS

PAGE

PREFACE 3

CHAPTER I — REVIEW OF FOURTH-GRADE WORK

In Vacation 13
READING AND WRITING NUMBERS 14
Using Large Numbers 15
ROMAN NUMERALS 17
ADDITION 18
Two-Column Addition by Endings 19
Addition Time Tests 21
Cost of School Supplies 23
SUBTRACTION 24
Subtraction Time Tests 24
SCHOOL PROBLEMS 25
LOCAL PROBLEMS 26
Kinds of Numbers 26
MULTIPLICATION 27
Multipliers Containing 0 27
Multiplication Time Tests 28
Multiplication with Larger Numbers 29
Multiplying by 10 ; 100 ; 1,000 29
FACTORY PROBLEMS 29
LOCAL PROBLEMS 30
The School Assembly Hall 30
DIVISION 32
SHORT DIVISION 32
LONG DIVISION 33
Division Time Tests 35
Division with Larger Divisors 36
Division with a Remainder 36
AVERAGE 37
PROBLEMS 37
LOCAL PROBLEMS 38
Facts about the United States 39
CHAPTER REVIEWS 39
GENERAL TESTS 44

CHAPTER II — COMMON FRACTIONS

HALVES, FOURTHS, EIGHTHS 46
Going to School 48
Halves and Fourths of Groups 49

PAGE

THIRDS, SIXTHS 50
PROBLEMS 51
Thirds of Groups 51
FIFTHS, TENTHS 52
PROBLEMS 53
SUBTRACTION 54
Fifths of Groups 54
A School Picnic 55
KINDS OF FRACTIONS 56
REDUCTION OF FRACTIONS 57
Reduction to Lowest Terms 57
Reduction to Higher Terms 58
Reduction of Improper Fractions to Mixed Numbers . . . 59
ADDITION OF FRACTIONS 59
Addition of Like Fractions 60
Reducing to the Least Common Denominator 60
Addition of Unlike Fractions 61
Addition of Mixed Numbers 62
At Mr. Brown's Farm 63
A Shopping Trip 64
SUBTRACTION OF FRACTIONS 65
Subtraction of Like Fractions 65
Subtraction of Unlike Fractions 65
Subtraction of Mixed Numbers 66
PROBLEMS 67
Outdoor Life 68
A Halloween Party 69
CHAPTER REVIEWS 70
GENERAL TESTS 73

CHAPTER III—UNITED STATES MONEY; USEFUL MEASURES

UNITED STATES MONEY 75
Making Change 75
Addition and Subtraction of United States Money . . . 76
PROBLEMS 76
Multiplication of United States Money 77
Multiplying by 10; 100; 1,000 78
Division of United States Money 78
Earning Money 79
Sending Money Orders 80
PROBLEMS 81
LOCAL PROBLEMS 82
USEFUL MEASURES 83

PAGE

LIQUID MEASURE 83
DRY MEASURE 85
MEASURES OF TIME 86
PROBLEMS 87
The General Store 88
The Neighborhood Grocery 89
CHAPTER REVIEWS 90
GENERAL TESTS 92
IMPROVEMENT TESTS 93

CHAPTER IV — COMMON FRACTIONS (*Continued*)

REDUCTION OF MIXED NUMBERS TO IMPROPER FRACTIONS . . 94
MULTIPLICATION OF FRACTIONS 95
I. Multiplication by an Integer 95
A. Multiplying Fractions by Integers 95
CANCELLATION 95
PROBLEMS 96
B. Multiplier or Multiplicand a Mixed Number . . . 97
PROBLEMS 97
II. Multiplication by a Fraction 98
A. Multiplying Fractions by Fractions 98
PROBLEMS 99
B. Multiplying Mixed Numbers by Fractions . . . 99
III. Multiplication of Mixed Numbers by Mixed Numbers . 100
PROBLEMS 100
Using and Changing Recipes 101
DIVISION OF FRACTIONS 102
I. Division by a Fraction 102
A. Dividing Integers by Fractions 102
PROBLEMS 102
B. Dividing Fractions by Fractions 103
C. Dividing Mixed Numbers by Fractions . . . 104
PROBLEMS 104
II. Division by an Integer 105
A. Dividing Fractions by Integers 105
PROBLEMS 105
B. Dividing Mixed Numbers by Integers . . . 106
A Bird House 107
III. Division by a Mixed Number 108
A. Dividing Integers by Mixed Numbers . . . 108
B. Dividing Mixed Numbers by Mixed Numbers . . 108
PROBLEMS 109
The Sewing Class 110

PAGE

Household Expenses 111
Chapter Reviews 113
General Tests 115

CHAPTER V — USEFUL MEASURES

Parcel Post 117
Measures of Weight 119
Local Problems 121
Problems 122
Measures of Length 122
Local Problems 123
A Baseball Game 125
Drawing to a Scale 126
Square Measure 128
Mr. Peterson's Farm 131
Chapter Reviews 132
General Tests 134

CHAPTER VI — APPLICATIONS OF FRACTIONS; DECIMAL NUMBERS

Knowing a Part, to Find the Whole 135
Problems 136
Simple Percentages as Fractions 136
Fifty per Cent 137
Twenty-five per Cent 138
Thirty-three and One Third per Cent 139
Seventy-five per Cent 140
Sixty-six and Two Thirds per Cent 141
Aliquot Parts of a Dollar 143
Problems 144
Poultry Raising 145
A Girls' Club 146
Decimal Numbers 147
A New Way of Writing Tenths and Hundredths . . . 147
Addition of Tenths and Hundredths 148
Changing Tenths to Hundredths 149
Subtraction of Tenths and Hundredths 149
Multiplication of Tenths and Hundredths by Integers . 150
Division of Tenths and Hundredths by Integers . . . 151
The School Playground 151
Chapter Reviews 154
Improvement Tests 159

CHAPTER VII — REVIEW OF FIFTH-GRADE WORK

PAGE

KEEPING A CASH ACCOUNT 161
An Automobile Trip 163
REVIEW OF THE FUNDAMENTAL OPERATIONS 165
ADDITION 165
Addition Time Tests 166
SUBTRACTION 167
Subtraction Time Tests 168
Making Change 168
MULTIPLICATION 170
Multiplication Time Tests 170
Boy Scout Problems 171
Girl Scout Problems 172
DIVISION 174
Division Time Tests 174
PRACTICE WITH LARGE NUMBERS 175
Earning Money for a Picture 179
ROMAN NUMERALS 180
PROFIT AND LOSS 181
PROBLEMS 181
GENERAL TESTS 183

CHAPTER VIII — BILLS AND RECEIPTS; PRACTICE WITH FRACTIONS

BILLS AND RECEIPTS 185
Buying Toys 188
Receipts 189
TESTS FOR DIVISIBILITY 190
DRILL EXAMPLES 191
PROBLEMS 192
At the Market 193
FINDING WHAT PART ONE NUMBER IS OF ANOTHER 194
PROBLEMS 194
KNOWING A PART, TO FIND THE WHOLE 195
PROBLEMS 195
COMPARISON 196
PROBLEMS 197
ALIQUOT PARTS, EXTENDED 198
ESTIMATING RESULTS 199
PROBLEMS 199
The Apple Crop 200
CHAPTER REVIEWS 201
GENERAL TESTS 203

CHAPTER IX — DECIMAL NUMBERS

PAGE

Review of Tenths and Hundredths 204
General Decimal Numbers 205
Writing Decimals 206
Reduction of Decimals 207
Reducing Decimal Fractions to Common Fractions . . . 207
ADDITION OF DECIMAL NUMBERS 208
SUBTRACTION OF DECIMAL NUMBERS 209
PROBLEMS 209
MULTIPLICATION OF DECIMAL NUMBERS 211
Multiplying by Integers 211
Multiplying by 10 ; 100 ; 1,000 211
Multiplying by 5 ; 50 ; 25 212
PROBLEMS 213
Multiplying by Decimal Numbers 213
PROBLEMS 214
DIVISION OF DECIMAL NUMBERS 215
Dividing by Integers 215
Dividing by 10 ; 100 ; 1,000 216
Dividing by Decimal Numbers 216
APPROXIMATE DIVISION 218
CHANGING COMMON FRACTIONS TO DECIMAL FRACTIONS . . 219
PROBLEMS 219
Taking a Journey 221
CHAPTER REVIEWS 224
GENERAL TESTS 229
IMPROVEMENT TESTS 231

CHAPTER X — PERCENTAGE AND ITS USES

SPECIAL PER CENTS 233
PROBLEMS 234
GENERAL PER CENTS 235
PROBLEMS 236
School Attendance 237
APPLICATIONS OF PERCENTAGE 237
DISCOUNT 237
Store Discounts 240
PROFIT AND LOSS 241
PROBLEMS 242
A Girl Scout Fair 242
COMMISSION 244
PROBLEMS 245

PAGE
INTEREST 246
DRILL EXAMPLES 248
PROBLEMS 250
FINDING THE RATE PER CENT 250
DRILL EXAMPLES 251
PROBLEMS 252
FINDING THE PER CENT OF PROFIT ON SALES 252
PROBLEMS 253
FINDING PER CENTS BY DIVISION 255
PROBLEMS 255
Selling Magazines 257
CHAPTER REVIEWS 258
The Washington School Baseball Season 261
GENERAL TESTS 263

CHAPTER XI — COMPOUND NUMBERS; PLANE FIGURES; CUBIC MEASURE

COMPOUND NUMBERS 265
Adding Compound Numbers 266
Subtracting Compound Numbers 267
Finding the Difference between Two Dates 268
Multiplying Compound Numbers 270
Dividing Compound Numbers 271
PLANE FIGURES 272
Area of a Triangle 274
Practical Measurements 275
Drawing to a Scale 276
A House Plan 279
CUBIC MEASURE 280
Volume of a Rectangular Solid 282
Useful Facts 283
CHAPTER REVIEWS 284
The School Garden 288
GENERAL TESTS 290

CHAPTER XII — TOPICAL REVIEWS

FUNDAMENTAL OPERATIONS 292
FRACTIONS 292
USEFUL MEASURES 293

PAGE

DECIMAL NUMBERS 294
PERCENTAGE 295
SURFACES AND VOLUMES 297
GENERAL PROBLEMS 298
GENERAL TESTS 301
IMPROVEMENT TESTS 303
DRILL EXAMPLES 305
Addition of Like Fractions 305
Addition of Unlike Fractions 305
Addition of Mixed Numbers 306
Subtraction of Like Fractions 308
Subtraction of Unlike Fractions 308
Subtraction with Mixed Numbers 309
Multiplication of Fractions 310
Division of Fractions 311
Addition of Decimals 313
Subtraction of Decimals 313
Multiplication of Decimals 314
Division of Decimals 315
Changing Common Fractions to Decimal Fractions . . . 316
Percentage 316
Discount 317
Commission 317
Interest 318
Finding Rate Per Cent 318

THE PILOT ARITHMETICS

BOOK TWO

CHAPTER I

REVIEW OF FOURTH-GRADE WORK

In Vacation

1. James earned $16.25 during vacation and spent $7.65 of this for radio supplies. How much did he have left?

2. Joe Brown kept a record of the number of papers he sold during vacation. His weekly records were: 143, 128, 150, 146, 157, 135, 151, 133, 149. How many papers did he sell?

3. Mary Brown read one book of 195 pages and two books of 240 pages each. How many pages were in the three books?

4. Arthur Jackson belonged to a vacation hiking club of 15 boys. Each boy paid dues of 10¢ a week. How much did

the dues amount to each week? How much did they amount to during the nine weeks of vacation?

5. One morning there were 69 children on the school playground and that afternoon there were 102 children. How many more children were on the playground in the afternoon than in the morning?

6. Walter Smith and his sister Clara sold fresh vegetables during vacation and divided the money equally. They took in $7.50 the first month and $9.80 the second month. How much was each one's share for the two months?

7. At the beginning of vacation Richard Snow had $14.89 in the savings bank. At the end of vacation he put in $5.40 of his earnings and his father put in for him the same amount. How much did Richard have in the bank then?

READING AND WRITING NUMBERS

Numbers of more than three figures are usually divided by commas, beginning at the right, into periods of three figures.

374,	291,	528
Millions	Thousands	Units

A period contains three places: hundreds, tens, and units. Each period, except the last one at the left, must have all the places filled; the period at the left may contain only one or two places.

Numbers are read, beginning at the left, by reading the hundreds, tens, and units in the periods and naming the periods. The units' period need not be named.

Thus, 58,279,062 is read, fifty-eight million two hundred seventy-nine thousand sixty-two.

Do not use the word *and* in reading whole numbers.

USING LARGE NUMBERS

1. Beginning at the right, name the first period; the second period; the third period.

2. Name the second place; the first place; the third place; the fifth place; the fourth place; the sixth place.

3. In which place does 1 thousand stand? 1 hundred? 1 million?

4. How many periods are in a number made up of 26 millions, 718 thousands, 406 units?

5. In the number 75,281,962, what does 75 represent? 281? 962?

6. How many places are there in five hundred twenty-seven? nineteen thousand three hundred fifty? six thousand two hundred eight?

7. What is the smallest number you can write with the figures 9, 1, 4, 2?

8. What is the largest number you can write with the figures 1, 4, 3, 2, 7?

Read.

1.	873	9.	71,003	17.	76,005,042
2.	603	10.	54,070	18.	60,000,090
3.	7,114	11.	70,102	19.	90,000,507
4.	6,200	12.	146,215	20.	475,230,611
5.	4,032	13.	402,109	21.	820,050,061
6.	7,007	14.	840,060	22.	400,004,004
7.	16,518	15.	200,002	23.	506,023,400
8.	48,250	16.	67,145,123	24.	730,046,000

Read.

1. The distance between New York and San Francisco is 3,191 miles.

2. Mount Washington is 6,288 feet high.

3. Pike's Peak is 14,147 feet high.

4. The length of the Mississippi River is 2,460 miles.

5. The area of Lake Superior is 32,060 square miles.

6. In 1919 there were 264,233 miles of railroads in the United States.

7. Mount Everest is 29,002 feet high.

8. The Yellowstone National Park contains 719,622 acres.

9. In 1920 the population of greater London was 7,476,168 and the population of greater New York was 7,910,415.

10. In a recent year the United States raised 403,296,000 bushels of potatoes.

Write in words.

1. 679	3. 8,026	5. 70,008	7. 860,224
2. 7,173	4. 20,200	6. 708,708	8. 28,460,046

Write in figures.

1. One thousand six hundred eight

2. Forty-two thousand forty-two

3. Eighteen thousand seven hundred thirty-seven

4. Nine hundred thousand ninety

5. Eighty million eighty thousand eighty

6. Two hundred five million two hundred thousand five

7. Nine hundred twenty-seven million seven hundred nine thousand nine hundred seven

ROMAN NUMERALS

Roman numerals are used chiefly in numbering clock and watch faces and chapters of books, and in writing dates.

The letters used for numbers less than four hundred are:

I = 1 V = 5 X = 10 L = 50 C = 100

Here are three rules that will help you to read and write Roman numerals.

1. When a numeral is repeated, its value is repeated.

III = 3 XX = 20 CCC = 300

A numeral is generally used in repetition but three times.

2. When a smaller numeral follows a larger, the values are added.

XV = 15 LXX = 70 CLI = 151

3. When a smaller numeral comes before a larger one, the smaller value is subtracted from the larger.

XL = 40 IX = 9 XC = 90

The following Roman numerals and their Arabic equivalents illustrate the methods of writing Roman numerals.

II = 2	IX = 9	XIX = 19	LX = 60
IV = 4	XI = 11	XX = 20	XC = 90
VI = 6	XIV = 14	XL = 40	CC = 200

Read.

XV	XXXVI	CLV	LXXXVI	CLXV
XVIII	LV	LXIV	CIX	CCCIV
XXI	XXXIV	XLII	XCIX	CCXX

Write Roman numerals for these Arabic numerals.

34	16	23	57	38	29	105	134
49	64	72	90	19	40	210	161

ADDITION

In addition we find a single number which is equal to two or more numbers taken together. We call the result the *sum* of the given numbers.

We can add only quantities of the same kind, such as 6 bushels and 8 bushels, or 10 feet and 7 feet. Sometimes quantities of different kinds can be given general names and then added. Thus, 9 robins and 5 sparrows are unlike and they cannot be added to give robins or sparrows. If we change to 9 birds and 5 birds, we can add and get 14 birds.

The sign of addition is +. It is read *plus* or *and*.

Give the sums of the following columns rapidly.

1.	3.	5.	7.	9.	11.
3	8	9	7	7	8
6	5	6	0	6	9
5	4	1	8	9	7
2.	**4.**	**6.**	**8.**	**10.**	**12.**
6	4	3	6	9	4
2	3	7	5	7	7
8	6	8	6	5	8

In examples like 13, think, "13, 16, 20, 25."

13.	14.	15.	16.	17.	18.
5	3	6	4	5	9
4	5	2	0	2	2
3	7	1	5	7	8
9	8	9	7	8	3
4	2	3	6	4	9

Add first by columns and then by rows.

	1.	2.	3.	4.	5.	6.	7.	8.
9.	8	+ 3	+ 1	+ 4	+ 5	+ 6	+ 4	+ 7 =
10.	4	+ 8	+ 3	+ 5	+ 3	+ 7	+ 2	+ 7 =
11.	7	+ 3	+ 5	+ 4	+ 5	+ 4	+ 8	+ 8 =
12.	3	+ 6	+ 5	+ 6	+ 4	+ 6	+ 4	+ 4 =
13.	6	+ 1	+ 4	+ 7	+ 2	+ 3	+ 7	+ 3 =
14.	2	+ 4	+ 1	+ 7	+ 3	+ 1	+ 5	+ 3 =
15.	1	+ 5	+ 7	+ 2	+ 4	+ 8	+ 1	+ 6 =
16.	5	+ 7	+ 2	+ 9	+ 8	+ 3	+ 6	+ 5 =

Two-Column Addition by Endings

1. 22+34 We think of 22+34 as, 22+30+4=52+4=56
2. 37+46 37+40+6=83
3. Add: 28 Think, "63, 71."
   43

Add by endings.

1.	22+31=	3.	56+33=	5.	62+45=	7.	50+67=
2.	45+12=	4.	24+65=	6.	82+55=	8.	74+54=

9.	28	10.	55	11.	48	12.	36	13.	99	14.	65
	16		37		44		84		48		79
15.	65	16.	83	17.	58	18.	94	19.	97	20.	51
	37		20		84		85		86		62
21.	12	22.	21	23.	32	24.	54	25.	18	26.	31
	23		40		21		17		38		53
	36		16		25		25		15		22

In addition always write the numbers neatly and so that the units figures, the tens, etc., are in straight columns.

To *check* or *prove* addition, add the columns downward. You should get the same result as was obtained by adding upward.

Add. Write answers only. Check your results.

1.	2.	3.	4.	5.	6.
36	98	42	43	64	652
20	19	79	756	587	839
41	17	24	22	30	724
68	25	76	918	921	153
15	34	37	64	455	546

7.	8.	9.	10.	11.	12.
683	28	29	62	78	588
60	32	864	931	518	943
749	919	37	736	65	761
24	760	924	94	713	627
537	623	68	519	896	983
46	87	695	608	630	865
380	869	78	593	795	739

13.	14.	15.	16.	17.	18.
127	207	315	765	321	460
375	633	234	254	245	332
953	424	110	618	862	555
333	170	273	122	415	216
325	362	517	431	233	348
911	345	432	185	168	725
554	426	825	216	234	661
167	182	207	523	111	194
543	714	484	616	562	268

Addition Time Tests

In all addition and subtraction time tests and practice sets, write answers only.

Test *A*. Time limit, 8 minutes

1.	2.	3.	4.	5.	6.
623	218	426	761	391	766
415	620	672	340	425	513
132	401	834	217	116	324
524	355	102	161	203	451
361	472	364	534	642	167
118	633	121	163	184	646
244	141	263	876	225	215
217	200	410	513	443	134
141	555	322	428	176	123

Pupils who fail to complete Test *A* within the time limit should first find and correct any mistakes and then work the examples in Practice Set *A* to prepare for tests *B* and *C*.

Practice Set *A*

1.	2.	3.	4.	5.	6.
242	265	181	330	426	286
321	334	342	479	720	101
106	106	220	267	545	527
513	571	765	821	354	632
765	420	634	314	137	354
842	368	152	223	272	475
237	275	207	407	583	566
452	151	664	532	115	143
330	347	351	165	351	328

7.	8.	9.	10.	11.	12.
164	626	615	123	305	354
235	463	224	306	641	233
406	205	183	472	263	706
523	518	546	241	712	252
210	625	211	558	176	620
475	432	302	634	524	567
728	226	715	427	435	475
531	321	263	163	386	121
116	460	127	315	501	354

Test *B*. Time limit, 8 minutes

1.	2.	3.	4.	5.	6.
488	723	630	418	275	527
124	442	129	393	329	681
213	277	552	105	842	737
372	277	226	136	716	416
826	145	317	563	531	125
429	546	802	229	792	278
435	413	345	642	423	342
582	874	361	413	242	864
165	331	547	768	516	539

Test *C*. Time limit, 7 minutes

1.	2.	3.	4.	5.
273	8,156	25	418	7,654
406	275	479	1,503	3,289
78	4,107	48	217	1,625
391	94	6,724	28	2,437
5	671	320	8,047	4,085
62	3,118	7,141	325	5,607
735	6	462	9,483	3,950
18	392	5,108	726	2,663
243	5,269	7	2,047	8,521

Cost of School Supplies

1. Miss Roberts has 36 pupils in her fifth-grade room. During the school year each pupil is given two erasers. How many erasers are needed? Find their cost at one cent each.

2. Each child is allowed four pencils a year. How many pencils are needed? Find the cost at two cents each.

3. Find the cost of supplying the room with histories at $1.20 each.

4. In this grade each child uses two notebooks worth 5¢ each and one spelling blank worth 2¢. How much is the cost for each child? How much is the cost for the room?

5. Each child uses about two sheets of school paper a day. How many sheets a day are required for the room? How many sheets for the school week?

6. Each child has an arithmetic worth 75¢, a reader worth 85¢, a history worth $1.20, and a geography worth $1.25. How much did the four books cost?

7. If half the pupils are supplied with new dictionaries at a cost of 90¢ each, how much will the dictionaries cost?

SUBTRACTION

In subtraction we take one number, called the *subtrahend*, from another number, called the *minuend*. The result is the *difference* or *remainder*. The difference may be obtained by finding the number that added to the subtrahend will give the minuend. This is the method generally used in making change.

486	*minuend*
329	*subtrahend*
157	*difference*

The sign of subtraction is − and it is read *minus* or *less*.

To check or prove subtraction, add the difference to the subtrahend. The result should equal the minuend.

1. 16−7= **3.** 25−8= **5.** 57−9= **7.** 73−6=
2. 12−5= **4.** 35−6= **6.** 31−8= **8.** 33−5=

Subtract. Check your results.

1. 684	**3.** 571	**5.** 330	**7.** 568	**9.** 8,576
352	233	118	129	3,124
2. 692	**4.** 734	**6.** 470	**8.** 380	**10.** 6,967
356	519	236	272	3,041

11. 5,732−1,468
12. 6,014−4,283
13. 6,203−1,870
14. 4,000−2,463
15. 5,100−2,928
16. 3,002−1,234
17. 1,260−985
18. 26,178−15,269
19. 50,130−25,246
20. 40,000−14,106

Subtraction Time Tests

Test *A*. Time limit, 4 minutes

1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**
53,708	67,532	50,693	82,437	70,342	33,035	82,103
26,430	15,624	32,187	48,165	24,753	20,672	44,109

Pupils who fail on Test *A* should find and correct their mistakes and then practice on the examples in Practice Set *A* until they are ready to take Test *B*.

Practice Set *A*

1.	2.	3.	4.	5.	6.	7.
31,264	25,130	38,504	27,110	10,262	23,200	40,314
13,145	11,342	21,412	23,456	6,353	15,805	31,325
8.	**9.**	**10.**	**11.**	**12.**	**13.**	**14.**
36,020	75,118	18,234	21,000	30,201	60,000	70,205
13,401	40,362	10,757	16,203	12,345	22,068	39,609

Test *B*. Time limit, 4 minutes

1.	2.	3.	4.	5.	6.	7.
25,613	51,308	40,121	34,015	63,180	54,010	35,203
17,150	32,471	27,413	16,523	52,364	25,342	27,184

SCHOOL PROBLEMS

1. The school enrollment of a city is: Park School, 672 pupils; North School, 815; Lincoln School, 598; Hill School, 723; high school, 615. How many pupils are in these schools?

2. There are 381 pupils in a school and 156 of them are boys. How many are girls?

3. One Saturday 131 school children went on a school picnic. Automobiles carried 47 of them and the rest went by trolley. How many went by trolley?

4. In September there were 317 pupils in a school. During the school year 18 new pupils entered and 36 pupils left. How many pupils were there at the end of the year?

LOCAL PROBLEMS

1. Find the number of pupils enrolled in each room in your school. What is the total number enrolled?

2. Look on your calendar at home and see how many days there are in each month. What is their sum?

3. Find how many desks there are in each room on your floor. What is the total number?

4. Measure the length and the width of your schoolroom. How much longer is the room than it is wide?

5. Find how large your city was in 1915 and in 1920. How much was the increase in five years?

6. Look in your geography for the population of two large cities in which you are interested. How much larger is one than the other?

7. How many pages are in your arithmetic? in your geography? in your reader? How many pages are in the three books?

8. Which has the greater number of pages, your arithmetic or your geography? How many more pages?

Kinds of Numbers

There are two kinds of numbers, *concrete* and *abstract*.

A *concrete number* refers to some particular object or measure, as:

5 apples, 2 quarts, 7 yards.

An *abstract number* does not refer to any particular object or measure. It simply represents so many units of number.

6, 12, 18, 21, are abstract numbers.

MULTIPLICATION

In multiplication we take a given number, called the *multiplicand*, as many times as there are units in another number, called the *multiplier*.

124	*multiplicand*
9	*multiplier*
1,116	*product*

The sign of multiplication is $\times$. It is called *times* when the multiplier is read first and *multiplied by* when the multiplicand is read first. The multiplier is always abstract. The multiplicand and the product are either both abstract or both concrete.

Find the product.

7,653
245
38265
30612
15306
1,874,985

We multiply 7,653 first by 5, then by 4, and then by 2, placing the first figure of each partial product under its multiplier. Adding the partial products, we get 1,874,985.

Multipliers Containing 0

Find the products.

A.	*B.*	*C.*	*D.*
428	374	794	2,950
706	130	200	370
2568	11220	158,800	206500
2996	374		8850
302,168	48,620		1,091,500

The first figure of each partial product is placed under its multiplier. Notice how the partial products are placed when there is a zero in the multiplier.

Find the products.

1. 86×17	6. 70×453	11. 62×5,803
2. 62×79	7. 80×906	12. 75×2,360
3. 148×32	8. 74×664	13. 82×3,243
4. 57×309	9. 56×6,012	14. 76×5,082
5. 602×76	10. 5,632×25	15. 85×6,314

Multiplication Time Tests

Test *A*. Time limit, 6 minutes after copying

1. 4,637 82	3. 4,253 65	5. 6,256 63
2. 3,506 74	4. 5,564 58	6. 7,856 37

Pupils who fail to complete Test *A* in 6 minutes should first find and correct their mistakes, then practice on the examples in Practice Set *A* until they are ready to do Test *B*.

Practice Set *A*

1. 52×1,354	5. 38×5,606	9. 80×6,150
2. 45×2,037	6. 53×6,285	10. 29×1,243
3. 63×4,256	7. 75×6,833	11. 78×2,625
4. 82×3,267	8. 56×9,214	12. 91×5,070

Test *B*. Time limit, 6 minutes after copying

1. 2,146 53	3. 3,028 75	5. 8,136 36
2. 4,861 28	4. 6,344 47	6. 7,288 83

Multiplication with Larger Numbers

Check some of these by interchanging multiplicand and multiplier.

1. 257×468
2. 253×109
3. 890×271
4. $507 \times 2{,}828$
5. $408 \times 2{,}309$
6. $9{,}080 \times 554$
7. $300 \times 1{,}342$
8. $832 \times 4{,}167$
9. $408 \times 6{,}054$
10. $7{,}968 \times 895$
11. $633 \times 2{,}854$
12. $5{,}040 \times 800$
13. $665 \times 3{,}728$
14. $4{,}600 \times 530$
15. $54 \times 46{,}345$

Multiplying by 10; 100; 1,000

42	63	78
10	100	1,000
420	6,300	78,000

To multiply a whole number by 10, annex one zero to the number; by 100, annex two zeros; by 1,000, annex three zeros.

1. 10×30
2. 10×75
3. 10×624
4. 10×800
5. 100×6
6. 100×12
7. 100×56
8. 100×20
9. $1{,}000 \times 2$
10. $1{,}000 \times 14$
11. $1{,}000 \times 18$
12. $1{,}000 \times 35$

FACTORY PROBLEMS

1. A factory uses 12 tons of coal each working day. How much coal will it use in 285 working days?

2. In this factory there are 274 girls each of whom earns $936 a year. How much do all these girls earn in a year?

3. In 1922 a timekeeper worked 296 days at the rate of $6 a day. How much money did he earn that year?

4. On one side of a factory street there are 10 house lots, each 65 feet wide. How long is the street?

5. A workman pays $18 a month rent. How much rent does he pay in one year? in three years?

6. The factory clock strikes 156 times a day. How many times does it strike in a year (365 da.)?

7. There are 426 persons in the factory who work 48 hours a week. How many hours a week is this for all?

8. The factory owns 70 machines that cost $325 each and 65 machines that cost $275 each. What was the cost of all?

9. One side of the factory building is four stories high. On each floor there are 24 windows with 8 panes of glass in each window. How many panes are on that side of the building?

10. The factory pay roll is $1,890 a day. How much does this amount to in a year of 310 working days?

LOCAL PROBLEMS

1. How many minutes a day does your arithmetic class meet? How many minutes does this amount to in a week?

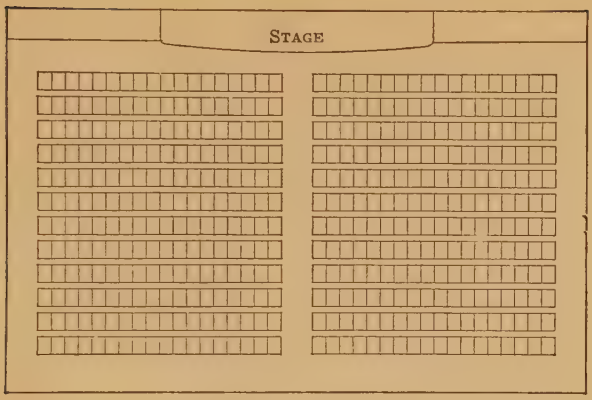
2. If each pupil in your room buys 3 postal savings stamps a month, how many stamps will be bought in the ten school months of the year?

3. How many screws did it take to fasten each desk and seat to the floor of your room? How many screws were needed for all the desks and seats?

4. If each child in your room drank 3 quarts of milk a week, how many quarts would be needed each week? How many quarts would be needed for a year (52 weeks)?

The School Assembly Hall

1. How many seats are in each row? How many rows are there? How can you find the number of seats without counting them all? How many seats are there?



2. At a school entertainment 11 rows of seats were filled. How many persons were in the audience?

3. The boys were called into the hall one morning and they filled 9 rows of seats. How many were present?

4. One morning the school attendance was as follows:

Grade	Pupils	Teachers	Grade	Pupils	Teachers
I	76	3	V	60	2
II	70	2	VI	56	2
III	66	2	VII	48	2
IV	64	2	VIII	40	1

How many teachers were present? How many pupils? How many teachers and pupils?

5. If the teachers and pupils of the first six grades were called to the hall, how many seats would they occupy?

6. Knowing the number of seats in the hall, can you find how many empty seats there would be?

7. How many vacant seats would there be if only the teachers and pupils of the four upper grades were in the hall?

DIVISION

In division we find how many times one number or amount, called the *divisor,* is contained in another number or amount, called the *dividend.* The result is called the *quotient.* When a part of the dividend remains undivided it is called the *remainder;* the remainder is always less than the divisor.

$5\frac{1}{6}$	6 is the *divisor.* 31 is the *dividend.*
$6\overline{)31}$	5 is the *quotient.* 1 is the *remainder.*

The sign of division is ÷ and it is read *divided by.*

Division may be *partition* or *measurement.*

Partition is the process of dividing the dividend into equal parts. Here the dividend and the quotient are both concrete and the divisor is abstract.

48 ft. ÷ 3 = 16 ft., that is, there are 3 equal lengths of 16 ft. in 48 ft.

Measurement is the process of using the divisor as a unit of measure to find how many times it is contained in the dividend. Here the dividend and the divisor are concrete and the quotient is abstract.

75 qt. ÷ 15 qt. = 5, that is, 75 qt. will contain 15 qt. 5 times.

SHORT DIVISION

When the divisor is 10 or less, we use short division. The work is not expressed; only the quotient is written.

74	8 is contained in 59, 7 times with the remainder 3.
$8\overline{)592}$	We place the 7 directly over the 9.
	8 is contained in 32, 4 times.
	The quotient is 74.

Give the following quotients at sight.

1. $35 \div 7 =$	**4.** $45 \div 9 =$	**7.** $118 \div 2 =$	**10.** $357 \div 7 =$
2. $48 \div 6 =$	**5.** $81 \div 9 =$	**8.** $128 \div 4 =$	**11.** $252 \div 6 =$
3. $72 \div 6 =$	**6.** $90 \div 6 =$	**9.** $208 \div 4 =$	**12.** $400 \div 8 =$

Divide.

1. $6\overline{)402}$	**4.** $7\overline{)840}$	**7.** $8\overline{)4{,}992}$	**10.** $5\overline{)6{,}750}$
2. $9\overline{)558}$	**5.** $9\overline{)1{,}917}$	**8.** $6\overline{)7{,}386}$	**11.** $6\overline{)8{,}538}$
3. $8\overline{)496}$	**6.** $8\overline{)3{,}040}$	**9.** $7\overline{)4{,}963}$	**12.** $9\overline{)5{,}220}$

LONG DIVISION

In long division all the work is written. The following examples show the process.

A. Divide 14,632 by 62.

```
        2 3 6
6 2)1 4,6 3 2
    1 2 4
      2 2 3
      1 8 6
        3 7 2
        3 7 2
            0
```

62 is contained in 146, 2 times. We place this 2, the first figure of the quotient, over 6, the last figure of the partial dividend 146.

Multiplying 62 by 2, we get 124, which we place under 146 and subtract. The remainder is 22.

We now bring down 3, the next figure of the dividend, and annex it to 22, giving 223.

62 is contained in 223, 3 times. This 3 becomes the next figure of the quotient.

Multiplying 62 by 3 we get 186, which we place under 223 and subtract. The remainder is 37.

We bring down 2, the next figure of the dividend and annex it to 37, giving 372.

62 is contained in 372, 6 times with no remainder.

The quotient is 236.

To find the number of times that 62 is contained in the different partial dividends, we used 6 as a guide. Thus, 6 is contained in 14, 2 times; in 22, 3 times; and in 37, 6 times.

If the divisor had been 68, however, we should have used 7 as a guide, because 68 is nearly 70.

What would you use as guides for the following divisors?

29 51 73 48 57 70 89 63

B 1. Divide 21,978 by 54.

```
    407
54)21,978
   216
   ---
    378
    378
    ---
      0
```

In this example, when we multiply by 4 and subtract the product, the remainder is 3. Bringing down the next figure of the dividend, we have 37.

As 37 contains 54, 0 times, the next figure of the quotient is 0. We bring down another figure of the dividend. We now have 378 which contains 54, 7 times. Our complete quotient is 407.

B 2. Divide 28,980 by 63.

```
    460
63)28,980
   252
   ---
    378
    378
    ---
      0
```

In this example there is no remainder after the second subtraction. As the next and last figure to be brought down is 0, the last figure of the quotient will be 0. The quotient, then, is 460.

The four main steps of division are:

Divide — multiply — subtract — bring down.

Remember that each product must be smaller than or equal to the corresponding partial dividend and each remainder must be smaller than the divisor.

To check or prove division, multiply the divisor by the quotient, and add the remainder. The result should equal the dividend. Check some of these.

1.	3,945 ÷ 15	**7.**	18,256 ÷ 28	**13.**	12,122 ÷ 38
2.	8,050 ÷ 25	**8.**	29,120 ÷ 52	**14.**	16,120 ÷ 65
3.	5,940 ÷ 18	**9.**	17,812 ÷ 73	**15.**	47,188 ÷ 94
4.	6,216 ÷ 37	**10.**	38,124 ÷ 54	**16.**	2,000 ÷ 40
5.	22,419 ÷ 53	**11.**	48,692 ÷ 74	**17.**	36,000 ÷ 80
6.	27,968 ÷ 46	**12.**	38,880 ÷ 81	**18.**	49,800 ÷ 60

Division Time Tests

Test *A*. Time limit, 9 minutes after copying

1.	**2.**	**3.**	**4.**	**5.**
43)22,188	65)15,795	56)19,600	48)21,408	85)51,595

Pupils who are not able to finish Test *A* in 9 minutes should first find and correct their mistakes and then practice on the examples in Practice Set *A* until they are ready to take Test *B*.

Practice Set *A*

1.	62)22,072	**6.**	82)11,972	**11.**	68)56,168
2.	55)23,485	**7.**	45)32,535	**12.**	91)64,337
3.	47)26,320	**8.**	67)24,723	**13.**	88)48,928
4.	65)28,470	**9.**	63)50,778	**14.**	38)14,820
5.	36)22,500	**10.**	75)42,750	**15.**	93)63,519

Test *B*. Time limit, 9 minutes after copying

1.	**2.**	**3.**	**4.**	**5.**
73)20,148	57)34,713	49)23,422	86)73,788	93)80,166

Division with Larger Divisors

```
      93
205)19,065
    1845
     615
     615
       0
```

In this example 1,906 is the first partial dividend.

Think, "How many 2's in 19? 9. $9\times205=1{,}845$ which is less than 1,906," so write 9 in the quotient over 6 and 1,845 under 1,906. Subtract. 61 is the remainder. 61 is less than 205, so bring down 5, making 615 the new partial dividend. Then think, "How many 2's in 6? 3. $3\times205=615$," so write 3 in the quotient over 5. The quotient is 93.

Divide.

1. $133\overline{)6{,}783}$
2. $427\overline{)11{,}956}$
3. $712\overline{)11{,}392}$
4. $425\overline{)17{,}000}$
5. $126\overline{)28{,}980}$
6. $343\overline{)36{,}015}$
7. $225\overline{)18{,}000}$
8. $411\overline{)147{,}960}$
9. $523\overline{)161{,}084}$
10. $642\overline{)204{,}156}$
11. $483\overline{)115{,}920}$
12. $525\overline{)294{,}000}$

Division with a Remainder

A.

```
  37 3/8
8)299
```

When we divide 299 by 8 we have a quotient 37, and a remainder 3, which has not been divided by 8. We indicate this division, however, by writing the remainder over the divisor, $\frac{3}{8}$. The quotient is $37\frac{3}{8}$. It is read, "thirty-seven and three eighths."

B.

```
     84 13/42
42)3,541
   336
   181
   168
    13
```

When we divide 3,541 by 42, the quotient is 84 and the remainder is 13. The complete result of the division is $84\frac{13}{42}$, and it is read, "eighty-four and thirteen forty-seconds."

Divide. Check some of these.

1. $6\overline{)504}$	8. $8\overline{)1,877}$	15. $88,625 \div 246$
2. $7\overline{)389}$	9. $7\overline{)4,399}$	16. $66,193 \div 318$
3. $8\overline{)656}$	10. $32,670 \div 45$	17. $107,168 \div 315$
4. $6\overline{)559}$	11. $41,579 \div 51$	18. $267,648 \div 816$
5. $8\overline{)615}$	12. $27,747 \div 46$	19. $100,000 \div 279$
6. $9\overline{)1,192}$	13. $42,924 \div 73$	20. $165,000 \div 307$
7. $9\overline{)677}$	14. $38,352 \div 94$	21. $300,006 \div 445$

AVERAGE

To find the *average* of any number of like quantities, divide their sum by the number of different quantities.

1. What is the average length of 6 sticks whose lengths are, 7 ft., 9 ft., 5 ft., 8 ft., 12 ft., 7 ft.?

The sum of the lengths is 48 ft. $48 \text{ ft.} \div 6 = 8$ ft., the average length.

2. A newsboy earned \$208 in a year selling papers. What were his average earnings per week (52 weeks in a year)?

Here the sum of the earnings of the different weeks is given, \$208.

$\$208 \div 52 = \$4$, the average earnings per week.

PROBLEMS

1. If a camping trip cost 8 boys \$128, how much should each boy pay toward the expenses?

2. How much is the average weight of three boys whose weights are 82 pounds, 76 pounds, and 85 pounds?

3. Shelled corn weighs 56 pounds to the bushel. How many bushels are there in a load of 2,128 pounds?

4. A man earned $1,665 on a piece of work covering 37 weeks. How much did he earn per week?

5. If the combined weight of 35 bales of cotton is 17,605 pounds, what is the average weight of the bales?

6. A man pays $444 rent a year. How much is the rent for one month? for five months?

7. The numbers of pupils in the seven different rooms of a school are 42, 39, 35, 41, 36, 43, 37. What is the average number of pupils per room?

8. A train covers a distance of 602 miles in 14 hours. What is the average rate per hour?

LOCAL PROBLEMS

1. Find the total number of tons of coal burned in your school building last winter. As this was all used in about six months, about how many tons per month were used?

2. Let each boy in your room tell his weight in pounds. Now find the average weight of the boys.

3. Find the average weight of the girls also.

4. Find the total number of pupils in your school and also the number of classrooms. What is the average number of pupils per room?

5. Ask your grocer how many pounds of butter he sold last week. How many pounds per day was that?

6. Find out also the average number of pounds of sugar he sold per day in the same week.

Facts about the United States

1. The length of our Canadian border is 3,900 miles and the length of our Mexican border is 1,975 miles. What is the combined length of these two border lines?

2. Our Atlantic coastline is 1,888 miles, our Pacific coastline 1,366 miles, and our Gulf coastline 1,629 miles. How many miles of coastline have we?

3. The greatest direct distance across our country is 2,800 miles and the greatest distance north and south is 1,700 miles. How much greater is the distance across the country than the distance north and south?

4. The water route from New York to San Francisco around Cape Horn is 13,135 miles. The water route through the Panama Canal to San Francisco is 5,262 miles. How many miles are saved by going through the canal?

CHAPTER REVIEWS

PROCESS REVIEW

1. How are numbers divided into periods to help in reading them? What are the groups that you have learned?

2. How many tens make a hundred? How many hundreds make a thousand? How many thousands make a million?

3. What letters are used in Roman numerals?

4. What effect does repeating a Roman numeral have? What is the effect of having a smaller Roman numeral follow a larger one? a smaller one come before a larger one?

5. What care should be used in writing a column of numbers for addition? What is the result called?

6. If in addition the sum of any column is 10 or more, what do you do?

7. How do you check or prove your work in addition?

8. What care should be used in writing numbers for subtraction? What is the result called in subtraction? What is the check or proof?

9. How do you multiply when there is a zero at the end of the multiplier? within the multiplier?

10. How do you multiply by 10? by 100? by 1,000?

11. What are the steps in a long division example? How many times should these steps be repeated?

12. Where should the divisor be placed? Where should the first figure of the quotient be placed?

13. When there is a remainder how is the complete quotient written?

14. What is the check or proof for division?

15. How do you find the average of several quantities?

16. If you know the number of houses on a street and the number on the left side, how can you find the number on the right side?

17. If you know the number of passengers in each of the cars of a train, how can you find the number on the train?

18. If you know the number of boys in a camp and the number in each squad, how can you find the number of squads?

19. If you know the cost of a single article and the number of articles, how can you find the cost of all of them?

ORAL EXERCISES

Read.

1. 2,020	**3.** 500,055	**5.** XLV	**7.** XCI
2. 71,005	**4.** 78,620,004	**6.** LXIII	**8.** CXLIV

Add the following by columns and then by rows.

	9.	10.	11.	12.	13.	14.	15.
16.	9	6	4	7	8	9	5
17.	7	3	9	1	7	7	4
18.	3	7	5	9	6	3	8
19.	7	5	8	6	7	9	2
20.	4	6	7	43	8	2	9

21. 32+26	**25.** 58−26	**29.** 10×92	**33.** 243÷3
22. 37+36	**26.** 62−37	**30.** 10×375	**34.** 366÷6
23. 54+37	**27.** 96−69	**31.** 100×35	**35.** 348÷4
24. 43+17	**28.** 60−24	**32.** 1,000×8	**36.** 240÷8

37. Four posts are 8 ft., 12 ft., 11 ft., and 9 ft. high. What is the average height of the posts?

38. A train runs 250 miles in 5 hours. What is the average number of miles it goes in one hour?

DRILL EXAMPLES

Write in words.

1. 4,045 **2.** 29,007 **3.** 305,510 **4.** 21,067,700

Write in figures.

1. Two thousand seven hundred fifty-three

2. Sixty-five thousand five

3. Two million ninety thousand six hundred twenty

Write in Roman numerals.

1. 65 **2.** 74 **3.** 27 **4.** 190

Add in 8 minutes.

1.	2.	3.	4.	5.	6.
215	115	431	535	551	613
346	610	172	148	839	870
437	132	351	275	171	182
136	408	416	312	364	226
522	392	220	450	247	252
443	515	117	653	626	363
262	647	528	201	417	453
358	453	614	439	582	647
621	718	253	134	452	627

Subtract in 5 minutes.

1. 62,509	3. 47,213	5. 62,580	7. 92,564
15,320	19,082	23,016	70,097
2. 90,352	4. 57,063	6. 80,561	8. 70,003
56,218	31,127	41,285	29,721

Multiply in 6 minutes.

1. 4,653	3. 5,814	5. 9,265
83	76	64
2. 6,878	4. 7,236	6. 8,763
68	59	75

Find the following products.

1. $6,162 \times 483$	4. $4,516 \times 255$	7. $2,868 \times 745$
2. $8,013 \times 144$	5. $7,602 \times 304$	8. $4,200 \times 500$
3. $3,836 \times 216$	6. $9,425 \times 407$	9. $3,146 \times 837$

Divide in 12 minutes.

1. $61,455 \div 85$
2. $54,400 \div 64$
3. $36,576 \div 72$
4. $39,634 \div 93$
5. $34,500 \div 57$
6. $55,447 \div 68$

Divide.

1. $90,045 \div 261$
2. $167,387 \div 324$
3. $195,831 \div 433$
4. $132,632 \div 562$
5. $218,890 \div 826$
6. $242,471 \div 781$

GENERAL PROBLEMS

1. There were 225 passengers on a train. At a station 76 persons got on and none got off. How many passengers were then on the train?

2. Knowing that 12 inches make a foot, find how many feet there are in 456 inches.

3. A man has to make a journey of 431 miles. His first train takes him 182 miles. How far has he still to go?

4. At a picnic there were 76 men, 82 women, and 135 children. How many persons attended the picnic?

5. How much was the average cost per acre of a 42-acre farm that was bought for $3,570?

6. A farmer had 275 chickens. He sold 90 of them. How many did he then have?

7. One bushel of oats weighs 32 pounds. How much does a carload of 1,800 bushels weigh?

8. A dealer auctioned off a carload of 19 horses. At the end of the auction he had taken in $3,325. What was the average price of the horses?

9. A field of potatoes, without fertilizer, yielded 175 bu. per acre. The next year the same field, fertilized, yielded 267 bu. per acre. How much was the gain per acre? the gain on a field of 12 acres?

10. After selling 50 bushels of potatoes a man still has 80 bushels on hand. How many bushels did he have at first?

11. What is the weight of 275 boxes of goods if each box of goods weighs 115 pounds?

12. A bushel of shelled corn weighs 56 pounds. How many bushels are there in 10,360 pounds of shelled corn?

13. What number must be added to 1,954 to give 2,832?

GENERAL TESTS

I

1. Add.

$$\begin{array}{r} 78 \\ 62 \\ 43 \\ 66 \\ 81 \\ 70 \\ \underline{59} \end{array}$$

2. Write 75 in Roman numerals.

3.

$$\begin{array}{r} 325 \\ -163 \\ \hline \end{array}$$

4. 57×254

5. $4{,}758 \div 26$

6. Find the average of these ages: 15 yr., 12 yr., 16 yr., 13 yr.

II

1. Add.

$$\begin{array}{r} 477 \\ 382 \\ 225 \\ 607 \\ 330 \\ \underline{514} \end{array}$$

2. Write in figures: six hundred eight thousand forty-two.

3.

$$\begin{array}{r} 70{,}206 \\ -28{,}364 \\ \hline \end{array}$$

4. $76 \times 3{,}451$

5. $32{,}335 \div 223$

6. There are 611 pupils in the Barrow School. 325 are girls. How many boys are there?

III

1. Write in figures: seven hundred eight thousand twenty-two.

2. $506 \times 3{,}450$

3. Take 6,525 from the sum of 1,779 and 5,523.

4. Find the average of these amounts: \$65, \$72, \$83, \$41, \$54.

5. Divide 27,241 by 65.

6. Thirty-four pupils belong in Miss Johnson's room. One day five pupils were absent, but two new children came into the room. How many were present that day?

IV

1. Add.

$$\begin{array}{r} 341 \\ 96 \\ 1{,}286 \\ 753 \\ 8 \\ 77 \\ 144 \\ \hline 2{,}626 \end{array}$$

2. Divide 130,782 by 426.

3. Write ninety-five in Roman numerals.

4. North Street is 4,203 feet long and Broad Street is 2,614 feet long. How much longer is North Street than Broad Street?

5. After driving 168 miles on a trip to Buffalo, Mr. Williams still has 157 miles to go. How many miles is it from his home to Buffalo?

6. There are 24 hours in a day. How many hours are there in a year (365 days)?

CHAPTER II

COMMON FRACTIONS

Halves, Fourths, Eighths

1. Into how many equal parts is A divided? What is each part called? How many halves are there?

2. One whole equals how many halves?

3. Into how many equal parts is B divided? What is each part called? What are two of the parts called? three of the parts? four of the parts?

4. One whole equals how many fourths? One half equals how many fourths?

5. Into how many equal parts is C divided? What is one of the parts called? What are three of the parts? five? six?

6. How many eighths are there in one whole? in one half? in one fourth? in three fourths?

A shorter way of writing three fourths is $\frac{3}{4}$; a shorter way of writing seven eighths is $\frac{7}{8}$. These expressions are called *common fractions.*

Fractions are used frequently in everyday life and in business. A boy walks $\frac{3}{4}$ mile to the store and buys $\frac{1}{2}$ pound of coffee and $\frac{1}{4}$ pound of butter. He pays for the groceries with half-dollars and quarter-dollars. In buying and selling and in many other daily operations, we have to do with fractional parts of dollars, inches, yards, miles, hours, etc.

A *unit* is any whole thing, such as: an apple, a foot, a quart.

A *fraction* is an expression which shows how many equal parts of a unit or a group of units are taken, as, $\frac{5}{8}$.

The *denominator*, or namer of a fraction, is the number that tells into how many equal parts a unit or a group of units is divided.

In $\frac{5}{8}$, 8 is the denominator; it gives the name "eighths" to the fraction. This fraction is read, "five eighths."

The *numerator*, or numberer of a fraction, is the number that tells how many of the equal parts are taken.

In $\frac{5}{8}$, 5 is the numerator; it tells us that 5 of the equal parts, the eighths, are taken.

The numerator and the denominator together are called the *terms* of a fraction.

A fraction whose numerator is 1, as, $\frac{1}{3}$, $\frac{1}{4}$, is a *unit fraction* or a *fractional unit*.

Read the following fractions, giving the numerator and the denominator of each and telling what the fraction means.

$\frac{1}{2}$ $\frac{1}{8}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{8}$

$1=\frac{?}{2}$ Read: "One equals how many halves?" One equals two halves.

Study the diagrams on page 46 and complete these examples.

1. $1=\frac{?}{4}$ $1=\frac{?}{8}$
2. $\frac{1}{2}=\frac{?}{4}$ $\frac{1}{2}=\frac{?}{8}$
3. $\frac{1}{4}=\frac{?}{8}$ $\frac{3}{4}=\frac{?}{8}$
4. $\frac{2}{2}=?$ $\frac{4}{4}=?$ $\frac{8}{8}=?$
5. $\frac{1}{2}+\frac{1}{2}=?$ $\frac{1}{4}+\frac{3}{4}=?$
6. $\frac{1}{4}+\frac{1}{4}=\frac{?}{4}=\frac{?}{2}$
7. $\frac{1}{8}+\frac{1}{8}=\frac{?}{8}=\frac{?}{4}$
8. $\frac{1}{8}+\frac{3}{8}=\frac{?}{8}=\frac{?}{2}$
9. $\frac{1}{8}+\frac{5}{8}=\frac{?}{8}=\frac{?}{4}$
10. $\frac{5}{8}+\frac{3}{8}=\frac{?}{8}=?$

$\frac{1}{2}+\frac{1}{4}=?$

$\frac{1}{2}=\frac{2}{4}$

$\frac{1}{4}=\frac{1}{4}$

$\frac{3}{4}$

1. $\frac{1}{4}+\frac{1}{8}$
2. $\frac{1}{4}+\frac{3}{8}$
3. $\frac{1}{4}+\frac{5}{8}$
4. $\frac{3}{4}+\frac{1}{8}$
5. $\frac{1}{4}+\frac{1}{2}$
6. $\frac{1}{2}+\frac{1}{8}$
7. $\frac{1}{2}+\frac{3}{8}$
8. $\frac{1}{2}+\frac{4}{8}$

From a study of the diagrams on page 46, complete these examples.

1. $\frac{3}{4}-\frac{1}{4}=\frac{?}{4}=\frac{?}{2}$
2. $\frac{5}{8}-\frac{1}{8}=\frac{?}{8}=\frac{?}{2}$
3. $\frac{7}{8}-\frac{5}{8}=\frac{?}{8}=?$
4. $\frac{7}{8}-\frac{1}{8}=\frac{?}{8}=?$

$\frac{5}{8}-\frac{1}{2}=?$

$\frac{5}{8}=\frac{5}{8}$

$\frac{1}{2}=\frac{4}{8}$

$\frac{1}{8}$

1. $\frac{1}{2}-\frac{1}{4}$
2. $\frac{1}{2}-\frac{3}{8}$
3. $\frac{3}{4}-\frac{1}{2}$
4. $\frac{3}{4}-\frac{5}{8}$
5. $\frac{3}{8}-\frac{1}{4}$
6. $\frac{7}{8}-\frac{1}{4}$
7. $\frac{7}{8}-\frac{1}{2}$
8. $\frac{7}{8}-\frac{3}{4}$

Going to School

1. Going to school, Mildred walks $\frac{1}{4}$ mile on King Street and $\frac{3}{8}$ mile on State Street. How far does she walk to school?

2. Walter lives $\frac{3}{4}$ mile from school and John lives $\frac{1}{2}$ mile from school. How much nearer the school does John live?

3. Richard walked $\frac{1}{4}$ mile going to school and $\frac{1}{2}$ mile back in order to do an errand. How far did he walk to school and back that afternoon?

4. Alice lives $\frac{7}{8}$ mile from school. On the way home she walked $\frac{1}{2}$ mile with Mary. How far had she still to go?

5. It is $\frac{1}{2}$ mile from Arthur's home to Robert's home by the road and $\frac{3}{8}$ mile across lots. What part of a mile is saved by going across lots?

HALVES AND FOURTHS OF GROUPS

1. In this rectangle there are 8 squares. If we divide these 8 squares into 2 equal groups, how many squares will be in each group?

2. What is one half of 8 squares?

3. What is one fourth of 8 squares? three fourths of 8 squares?

4. What is one half of 4 apples? one half of 12 oranges?

5. What is one fourth of 4 marbles? of 8 blocks? of 12 cents?

6. What is three fourths of 4 apples? of 8 pears? of 12 cherries?

7. In a class of 12 children, one half are boys. How many children are boys?

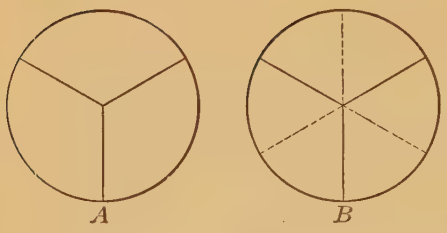
8. May's cousin lives 8 miles away, and her grandmother lives $\frac{1}{4}$ as far away. How far is it to May's grandmother's house?

9. There were 12 eggs in a basket and $\frac{3}{4}$ of them were white. How many white eggs were there?

10. Of 16 apples in a fruit dish, $\frac{1}{4}$ are sweet apples. How many sweet apples are in the dish?

11. There are 20 girls in Miss Johnson's class and $\frac{3}{4}$ of them have earned some money to help buy a picture for the room. How many girls have helped in this way?

THIRDS, SIXTHS



1. Into how many equal parts is A divided? What is each part called? How many thirds are there?

2. One whole equals how many thirds?

3. What are two of the equal parts of A called?

4. Into how many equal parts is B divided? What is each part called? What are five of the parts called? three of the parts?

5. One whole equals how many sixths? One half equals how many sixths? One third equals how many sixths?

6. Read these fractions.

$\frac{2}{3}$ $\frac{1}{6}$ $\frac{5}{6}$ $\frac{1}{3}$ $\frac{3}{6}$ $\frac{4}{6}$

ORAL EXERCISE

Study the diagrams above and complete these examples.

1. $1 = \frac{?}{3}$ $1 = \frac{?}{6}$
2. $\frac{1}{3} = \frac{?}{6}$ $\frac{2}{3} = \frac{?}{6}$ $\frac{1}{2} = \frac{?}{6}$
3. $\frac{3}{3} = ?$ $\frac{6}{6} = ?$
4. $\frac{2}{6} = \frac{?}{3}$ $\frac{3}{6} = \frac{?}{2}$ $\frac{4}{6} = \frac{?}{3}$
5. $\frac{1}{3} + \frac{2}{3} = ?$ $\frac{1}{6} + \frac{5}{6} = ?$
6. $\frac{1}{6} + \frac{1}{6} = \frac{?}{6} = \frac{?}{3}$
7. $\frac{2}{3} - \frac{1}{3} = ?$
8. $\frac{5}{6} - \frac{1}{6} = ? = ?$
9. $1 - \frac{2}{3} = ?$
10. $1 - \frac{1}{6} = ?$
11. $1 - \frac{5}{6} = ?$
12. $\frac{2}{3} - \frac{2}{3} = ?$

$\frac{1}{3} + \frac{1}{6} = ?$
$\frac{1}{3} = \frac{2}{6}$
$\frac{1}{6} = \frac{1}{6}$
$?$

1. $\frac{2}{3} + \frac{1}{6}$
2. $\frac{1}{3} - \frac{1}{6}$
3. $\frac{1}{2} + \frac{1}{6}$
4. $\frac{5}{6} - \frac{2}{3}$
5. $\frac{5}{6} - \frac{1}{2}$
6. $\frac{1}{2} - \frac{1}{6}$
7. $\frac{2}{3} - \frac{1}{2}$
8. $\frac{1}{2} + \frac{1}{3}$
9. $\frac{1}{2} - \frac{1}{3}$

PROBLEMS

1. Mary walks $\frac{1}{6}$ mile to the trolley car and then rides $\frac{2}{3}$ mile to school. What part of a mile is it from her home to the school?

2. From a piece of cloth $\frac{2}{3}$ yard long, Ruth used $\frac{1}{6}$ yard to make a doll's dress. How much cloth was left?

3. James spent $\frac{1}{2}$ hour doing his arithmetic and then $\frac{1}{6}$ hour looking it over. What part of an hour did he spend on his arithmetic?

4. It is $\frac{1}{2}$ mile from Helen's home to Mary's and $\frac{1}{3}$ mile from Mary's home on to Rachel's. How far is it from Helen's home to Rachel's?

5. Kenneth went $\frac{2}{3}$ mile on an errand. One half mile of this distance was on a level road and the rest was uphill. What part of a mile was uphill?

THIRDS OF GROUPS

Here are twelve balls divided into three equal groups. When we divide a group of things into three equal parts, what is each part called?

1. What is one third of 12 balls? two thirds of 12 balls?

2. What is one third of 9 books? two thirds of 9 books?

3. Walter has 9 chickens. Two thirds of them he bought with his own money. How many of the chickens did he buy?

4. Of the 15 girls in Miss Bradley's room, one third know how to swim. How many know how to swim?

5. Richard has \$12 in the bank. He earned $\frac{2}{3}$ of it himself. How many dollars of this amount did he earn?

6. There are 18 girls in a club and $\frac{2}{3}$ of them sit in Miss Smith's room. How many of Miss Smith's girls belong to this club?

7. In a fruit dish there were 8 Baldwin apples and 7 Greening apples. Two thirds of the apples were eaten at dinner. How many were left?

FIFTHS, TENTHS

1. Into how many equal parts is *A* divided? What is one of the parts called? What are two of the parts? three? four?

2. One whole equals how many fifths?

3. Into how many equal parts is *B* divided? What is each part called? What are three of the parts called?

4. One whole equals how many tenths? One half equals how many tenths? Three fifths equals how many tenths?

5. Read these fractions.

$\frac{2}{5}$ $\frac{3}{10}$ $\frac{7}{10}$ $\frac{1}{5}$ $\frac{4}{5}$ $\frac{3}{5}$ $\frac{9}{10}$

(Without pencil)

1. $1 = \frac{?}{5}$ $1 = \frac{?}{10}$
2. $\frac{1}{5} = \frac{?}{10}$ $\frac{1}{2} = \frac{?}{10}$
3. $\frac{2}{5} = \frac{?}{10}$ $\frac{3}{5} = \frac{?}{10}$ $\frac{4}{5} = \frac{?}{10}$
4. $\frac{6}{10} = \frac{?}{5}$ $\frac{8}{10} = \frac{?}{5}$
5. $\frac{1}{5} + \frac{1}{5} =$
6. $\frac{2}{5} + \frac{1}{5} =$
7. $\frac{4}{5} + \frac{1}{5} =$
8. $\frac{2}{5} + \frac{2}{5} =$
9. $\frac{1}{10} + \frac{1}{10} =$
10. $\frac{3}{10} + \frac{3}{10} =$
11. $\frac{7}{10} + \frac{1}{10} =$
12. $\frac{9}{10} + \frac{1}{10} =$

$\frac{1}{5}+\frac{3}{10}=?$

$\frac{1}{5}=\frac{2}{10}$

$\frac{3}{10}=\frac{3}{10}$

$\frac{5}{10}=\frac{1}{2}$

1. $\frac{2}{5}+\frac{3}{10}$
2. $\frac{1}{5}+\frac{7}{10}$
3. $\frac{2}{5}+\frac{1}{10}$
4. $\frac{2}{5}+\frac{1}{2}$
5. $\frac{1}{5}+\frac{1}{2}$
6. $\frac{3}{5}+\frac{1}{10}$
7. $\frac{3}{5}+\frac{3}{10}$
8. $\frac{3}{10}+\frac{1}{2}$
9. $\frac{1}{2}+\frac{1}{10}+\frac{3}{10}$
10. $\frac{2}{5}+\frac{1}{2}+\frac{1}{10}$

PROBLEMS

1. A man planted $\frac{1}{2}$ acre of potatoes and afterwards planted $\frac{2}{5}$ acre. How much did he then have planted?

2. Lucy helped her father stamp some letters. She stamped $\frac{3}{5}$ of them before supper and $\frac{1}{10}$ of them after supper. What part of the work had she finished?

3. Robert bought a supply of picture postcards. On the school days of one week he sold $\frac{3}{10}$ of them and on Saturday $\frac{2}{5}$ of them. What part of the cards did he sell that week?

4. Two fifths of the pupils in Miss Brown's room bought postal savings stamps on Tuesday morning and one tenth of them bought stamps on Tuesday afternoon. What part of the pupils bought postal savings stamps that day?

5. At a school entertainment $\frac{7}{10}$ of those present were schoolchildren and $\frac{1}{5}$ of them were parents of the children. What part of the audience were schoolchildren and their parents?

6. It took Walter $\frac{1}{2}$ hour to go on an errand, but only $\frac{1}{10}$ hour to ride back in an automobile. What part of an hour did the errand take?

7. In going to school Elizabeth walks $\frac{1}{2}$ mile on Bay St., $\frac{1}{5}$ mile on Walnut St., and $\frac{1}{10}$ mile on Union St. How far does Elizabeth walk to school?

SUBTRACTION

(Without pencil)

1. $\frac{2}{5}-\frac{1}{5}$
2. $\frac{3}{5}-\frac{2}{5}$
3. $\frac{4}{5}-\frac{1}{5}$
4. $\frac{4}{5}-\frac{2}{5}$
5. $\frac{3}{10}-\frac{1}{10}$
6. $\frac{9}{10}-\frac{7}{10}$
7. $\frac{7}{10}-\frac{3}{10}$
8. $\frac{9}{10}-\frac{1}{10}$

(With pencil)

$\frac{7}{10}-\frac{1}{2}=?$

$\frac{7}{10}=\frac{7}{10}$

$\frac{1}{2}=\frac{5}{10}$

$\frac{2}{10}=\frac{1}{5}$

1. $\frac{3}{10}-\frac{1}{5}$
2. $\frac{2}{5}-\frac{1}{10}$
3. $\frac{3}{5}-\frac{3}{10}$
4. $\frac{1}{2}-\frac{1}{10}$
5. $\frac{4}{5}-\frac{7}{10}$
6. $\frac{9}{10}-\frac{4}{5}$
7. $\frac{1}{2}-\frac{3}{10}$
8. $\frac{4}{5}-\frac{3}{10}$
9. $\frac{7}{10}-\frac{3}{5}$
10. $\frac{9}{10}-\frac{1}{5}$
11. $\frac{1}{2}-\frac{2}{5}$
12. $\frac{4}{5}-\frac{1}{2}$
13. $\frac{1}{2}-\frac{1}{5}$
14. $\frac{3}{5}-\frac{1}{2}$
15. $1-\frac{7}{10}$

FIFTHS OF GROUPS

Here are ten blocks in five equal groups of two blocks.

1. What is one fifth of 10 blocks? three fifths of 10 blocks? four fifths?

2. What is one fifth of 5 marbles? three fifths of 5 marbles? two fifths? four fifths?

3. A man set out two young trees. One was 10 feet tall and the other was $\frac{3}{5}$ as tall. How tall was the smaller tree?

4. Arthur brought in from the barn 15 eggs of which $\frac{1}{5}$ were brown. How many eggs were brown?

5. Lucy earned 10 cents and spent $\frac{4}{5}$ of it for a pencil and an eraser. How much did the pencil and eraser cost?

6. Raymond and his brother rode on their bicycles to a camp 20 miles away, riding $\frac{3}{5}$ of the distance before noon. How long was their morning trip?

A School Picnic

Miss Shaw's pupils had a picnic.

1. Three fifths of the 20 girls in the room went. How many girls were at the picnic?

2. Two thirds of the 21 boys went. How many boys went?

3. They rode for $\frac{1}{2}$ hour on the trolley and then walked for $\frac{1}{4}$ hour. How long did it take to go?

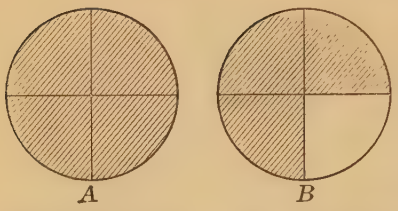
4. Two of the boys walked $\frac{3}{4}$ mile to a store for crackers and came back through the woods over a $\frac{1}{2}$ mile trail. What distance did they save coming back?

5. Tom and Dick chose teams for a baseball game. Tom's team had 16 runs and Dick's team $\frac{3}{4}$ as many runs. By how many runs did Tom's team win?

6. In the races for girls, $\frac{1}{2}$ the girls entered the first race and $\frac{1}{3}$ the girls entered the second race. How many girls raced?

7. Ruth won the first race in 10 seconds and Mabel won the second race in $\frac{4}{5}$ of that time. What was Mabel's time?

KINDS OF FRACTIONS



1. What part of B is shaded? Write this as a fraction.

2. How much of A is shaded? Write this as a fraction. Compare the numerator with the denominator.

3. How many fourths are in the shaded portions of A and B together? Write this as a fraction. Which is larger, the numerator or the denominator?

4. We may consider the shaded portions of A and B together as one whole unit and how many fourths?

A *proper fraction* is a fraction whose numerator is less than its denominator.

$\frac{3}{4}$, $\frac{5}{8}$ are proper fractions.

An *improper fraction* is a fraction whose numerator is equal to or greater than its denominator.

$\frac{4}{4}$, $\frac{7}{4}$, $\frac{3}{2}$ are improper fractions.

Improper fractions represent either a whole unit or more than a whole unit.

An *integer* is a number which represents a whole number of things.

A *mixed number* is composed of an integer and a fraction.

$1\frac{3}{4}$, $6\frac{1}{2}$, $8\frac{2}{3}$ are mixed numbers.

$8\frac{2}{3}$ is read, "eight and two thirds"; it means 8 whole units and $\frac{2}{3}$ of another unit.

Tell whether each of the following is a proper fraction, an improper fraction, an integer, or a mixed number.

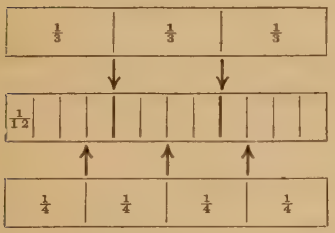
1. $\frac{8}{9}$	4. $7\frac{1}{8}$	7. $\frac{7}{10}$	10. $9\frac{4}{5}$	13. $\frac{17}{10}$
2. 6	5. $\frac{6}{6}$	8. $\frac{11}{8}$	11. $25\frac{3}{7}$	14. $14\frac{3}{5}$
3. $\frac{7}{5}$	6. $3\frac{1}{3}$	9. 5	12. 14	15. $\frac{13}{12}$

REDUCTION OF FRACTIONS

A fraction is reduced when its terms are changed without changing the value of the fraction.

We have found from our diagrams that $\frac{6}{8}=\frac{3}{4}$. Here $\frac{6}{8}$ is reduced to fourths.

From the diagrams we see that:



$\frac{2}{3}=\frac{8}{12}$; or, $\frac{2}{3}=\frac{2\times4}{3\times4}=\frac{8}{12}$

$\frac{1}{4}=\frac{3}{12}$; or, $\frac{1}{4}=\frac{1\times3}{4\times3}=\frac{3}{12}$

$\frac{4}{12}=\frac{1}{3}$; or, $\frac{4}{12}=\frac{4\div4}{12\div4}=\frac{1}{3}$

$\frac{9}{12}=\frac{3}{4}$; or, $\frac{9}{12}=\frac{9\div3}{12\div3}=\frac{3}{4}$

From the above examples we see that:

The value of a fraction is not changed if both the numerator and the denominator are multiplied by the same number or are divided by the same number.

Reduction to Lowest Terms

A fraction is in its lowest terms when the numerator and the denominator are divisible by no common integer except 1.

$\frac{5}{7}$, $\frac{3}{5}$, $\frac{4}{9}$, $\frac{11}{16}$, are fractions in their lowest terms.

$\frac{8}{12}$ is not in its lowest terms because both the numerator and the denominator are divisible by 4. $\frac{8}{12}=\frac{2}{3}$

To reduce a fraction to its lowest terms, divide both numerator and denominator by the same number. Continue such divisions until the numerator and the denominator have no common divisor except 1.

Reduce $\frac{18}{24}$ to its lowest terms.

Dividing numerator and denominator by 6, we get $\frac{18}{24}=\frac{3}{4}$.

Reduce these fractions to lowest terms where possible.

1. $\frac{6}{18}$	**2.** $\frac{8}{10}$	**3.** $\frac{15}{20}$	**4.** $\frac{9}{16}$	**5.** $\frac{7}{9}$
$\frac{5}{8}$	$\frac{14}{16}$	$\frac{12}{18}$	$\frac{10}{15}$	$\frac{14}{15}$

Divide, reducing the remainders to lowest terms.

6. $596\div 8$	**8.** $955\div 15$	**10.** $2{,}126\div 16$	**12.** $3{,}956\div 32$
7. $777\div 12$	**9.** $1{,}254\div 8$	**11.** $5{,}076\div 24$	**13.** $8{,}496\div 27$

Reduction to Higher Terms

$\frac{3}{5}=\frac{3\times 8}{5\times 8}=\frac{24}{40}$ Here $\frac{3}{5}$ is reduced to higher terms.

To reduce a fraction to higher terms, multiply both numerator and denominator by the same number.

Reduce these fractions to the higher terms indicated.

1. $\frac{1}{2}=\frac{?}{4}=\frac{?}{8}=\frac{?}{16}$	**5.** $\frac{4}{5}=\frac{?}{20}$	**9.** $\frac{5}{8}=\frac{?}{16}$
2. $\frac{1}{3}=\frac{?}{6}=\frac{?}{9}=\frac{?}{12}$	**6.** $\frac{4}{9}=\frac{?}{18}$	**10.** $\frac{1}{2}=\frac{?}{20}$
3. $\frac{2}{3}=\frac{?}{6}=\frac{?}{9}=\frac{?}{15}$	**7.** $\frac{3}{8}=\frac{?}{16}$	**11.** $\frac{4}{5}=\frac{?}{15}$
4. $\frac{3}{4}=\frac{?}{8}=\frac{?}{16}=\frac{?}{20}$	**8.** $\frac{7}{10}=\frac{?}{20}$	**12.** $\frac{11}{12}=\frac{?}{24}$

Reduction of Improper Fractions to Mixed Numbers

1. Measure off on your ruler 3 half inches. Three half inches is equal to 1 whole inch and how much more? Then $\frac{3}{2} = 1\frac{1}{2}$.

2. Now measure off 7 quarter inches. Seven quarter inches is equal to one whole inch and how much more? Then $\frac{7}{4} = ?$

3. On the line above, each one of the small divisions represents $\frac{1}{3}$ of a unit. 8 of these small divisions make how many whole units? What part of the next unit is taken? Then $\frac{8}{3} = 2\frac{2}{3}$.

What is the quotient if we divide 8 by 3?

To reduce an improper fraction to a whole number or a mixed number, divide the numerator by the denominator.

$$\frac{35}{8} = 4\frac{3}{8}$$

Reduce these fractions to whole numbers or to mixed numbers.

1. $\frac{12}{4}$	**2.** $\frac{11}{3}$	**3.** $\frac{17}{6}$	**4.** $\frac{16}{9}$	**5.** $\frac{50}{9}$	**6.** $\frac{29}{12}$
$\frac{15}{4}$	$\frac{13}{5}$	$\frac{25}{5}$	$\frac{27}{8}$	$\frac{56}{8}$	$\frac{55}{12}$

ADDITION OF FRACTIONS

Like fractions are fractions that have like denominators. They are fractions with the same name.

$\frac{2}{5}$ and $\frac{1}{5}$ are like fractions, both being fifths.

Unlike fractions have different denominators, and hence different names.

$\frac{1}{5}$ and $\frac{3}{4}$ are unlike fractions.

Addition of Like Fractions

From our work with the diagrams we have seen that:

$\frac{1}{5}+\frac{3}{5}=\frac{4}{5}$ $\frac{1}{8}+\frac{3}{8}=\frac{4}{8}=\frac{1}{2}$ $\frac{3}{10}+\frac{5}{10}=\frac{8}{10}=\frac{4}{5}$

From such examples we get the following rule:

To add like fractions, add the numerators and place their sum over the common denominator. Reduce the resulting fraction if possible.

1. $\frac{1}{3}+\frac{1}{3}$
2. $\frac{1}{5}+\frac{3}{5}$
3. $\frac{5}{9}+\frac{2}{9}$
4. $\frac{4}{15}+\frac{7}{15}$
5. $\frac{1}{5}+\frac{2}{5}+\frac{1}{5}$
6. $\frac{2}{15}+\frac{8}{15}+\frac{1}{15}$

Add. Reduce the results when possible.

1. $\frac{3}{8}+\frac{3}{8}$
2. $\frac{1}{10}+\frac{7}{10}$
3. $\frac{7}{12}+\frac{1}{12}$
4. $\frac{2}{3}+\frac{2}{3}$
5. $\frac{4}{5}+\frac{4}{5}$
6. $\frac{5}{8}+\frac{3}{8}$
7. $\frac{3}{4}+\frac{3}{4}$
8. $\frac{5}{6}+\frac{5}{6}$
9. $\frac{7}{8}+\frac{3}{8}$
10. $\frac{5}{8}+\frac{7}{8}$
11. $\frac{9}{10}+\frac{9}{10}$
12. $\frac{11}{12}+\frac{7}{12}$
13. $\frac{3}{5}+\frac{2}{5}$
14. $\frac{7}{8}+\frac{7}{8}$
15. $\frac{7}{12}+\frac{5}{12}$
16. $\frac{3}{10}+\frac{3}{10}$
17. $\frac{13}{16}+\frac{15}{16}$
18. $\frac{11}{12}+\frac{11}{12}+\frac{11}{12}$
19. $\frac{7}{18}+\frac{5}{18}+\frac{11}{18}$
20. $\frac{17}{20}+\frac{7}{20}+\frac{11}{20}$

See page 305 for additional drill examples.

Reducing to the Least Common Denominator

Unlike fractions cannot be added directly. We first change them to fractions having the least common denominator; that is, the smallest number that will contain all the denominators without a remainder.

The least common denominator can generally be found quickly by trial. First try the largest denominator, then twice the largest denominator, then three times the largest denominator, etc.

A. Reduce $\frac{1}{2}$ and $\frac{3}{8}$ to fractions having the least common denominator.

The least common denominator is 8.

$$\frac{1}{2} = \frac{1\times4}{2\times4} = \frac{4}{8}; \quad \frac{3}{8} = \frac{3}{8}$$

$\frac{4}{8}$ and $\frac{3}{8}$ are the required fractions.

B. Reduce $\frac{5}{6}$ and $\frac{3}{4}$ to fractions having the least common denominator.

We try 6, and 2×6. 6 is not divisible by 4, but 12 is divisible by 4. The least common denominator is 12.

$$\frac{5}{6} = \frac{5\times2}{6\times2} = \frac{10}{12}; \quad \frac{3}{4} = \frac{3\times3}{4\times3} = \frac{9}{12}$$

$\frac{10}{12}$ and $\frac{9}{12}$ are the required fractions.

To reduce fractions to fractions having the least common denominator, multiply both terms of each fraction by the number necessary to produce the least common denominator.

Reduce each group of these fractions to fractions having the least common denominator.

1. $\frac{1}{2}$, $\frac{3}{4}$
2. $\frac{1}{2}$, $\frac{5}{6}$
3. $\frac{3}{4}$, $\frac{5}{8}$
4. $\frac{2}{5}$, $\frac{3}{10}$
5. $\frac{5}{6}$, $\frac{5}{12}$
6. $\frac{1}{6}$, $\frac{2}{9}$
7. $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$
8. $\frac{1}{6}$, $\frac{2}{3}$, $\frac{4}{9}$

Addition of Unlike Fractions

From such examples as those on page 53, we get the following rule:

$\frac{3}{4}+\frac{2}{3}=?$

$\frac{3}{4}=\frac{9}{12}$

$\frac{2}{3}=\frac{8}{12}$

$\frac{17}{12}=1\frac{5}{12}$

To add unlike fractions, reduce them to fractions having the least common denominator and add the resulting like fractions. Reduce the result when possible.

1. $\frac{1}{4}+\frac{5}{8}$	8. $\frac{5}{6}+\frac{5}{12}$	15. $\frac{3}{4}+\frac{7}{10}$	22. $\frac{1}{6}+\frac{1}{3}+\frac{11}{18}$
2. $\frac{2}{3}+\frac{1}{6}$	9. $\frac{2}{3}+\frac{3}{4}$	16. $\frac{5}{6}+\frac{4}{9}$	23. $\frac{3}{4}+\frac{5}{6}+\frac{1}{2}$
3. $\frac{2}{3}+\frac{5}{12}$	10. $\frac{1}{2}+\frac{7}{8}$	17. $\frac{1}{2}+\frac{3}{8}+\frac{3}{4}$	24. $\frac{1}{3}+\frac{1}{6}+\frac{3}{4}$
4. $\frac{3}{4}+\frac{7}{12}$	11. $\frac{5}{6}+\frac{11}{12}$	18. $\frac{2}{3}+\frac{1}{6}+\frac{5}{12}$	25. $\frac{1}{2}+\frac{1}{6}+\frac{7}{9}$
5. $\frac{1}{2}+\frac{2}{3}$	12. $\frac{1}{2}+\frac{7}{10}$	19. $\frac{2}{5}+\frac{3}{10}+\frac{4}{5}$	26. $\frac{3}{4}+\frac{11}{12}+\frac{1}{6}$
6. $\frac{5}{6}+\frac{3}{4}$	13. $\frac{4}{5}+\frac{7}{10}$	20. $\frac{1}{6}+\frac{3}{4}+\frac{5}{12}$	27. $\frac{1}{4}+\frac{5}{6}+\frac{2}{3}$
7. $\frac{1}{6}+\frac{1}{4}$	14. $\frac{1}{2}+\frac{4}{5}$	21. $\frac{3}{4}+\frac{2}{3}+\frac{11}{12}$	28. $\frac{1}{2}+\frac{9}{10}+\frac{3}{5}$

See pages 305 and 306 for additional drill examples.

Addition of Mixed Numbers

Add $9\frac{2}{3}$, $17\frac{5}{6}$, and $15\frac{3}{4}$.

$9\frac{2}{3}$	$\frac{8}{12}$
$17\frac{5}{6}$	$\frac{10}{12}$
$15\frac{3}{4}$	$\frac{9}{12}$
$2\frac{1}{4}$	$\frac{27}{12}=2\frac{1}{4}$
41	
$43\frac{1}{4}$	

Reducing the fractions to fractions having the least common denominator and adding, we get $\frac{27}{12}$ or $2\frac{1}{4}$. Adding the integers, we get 41. Adding the results, we have $43\frac{1}{4}$, the sum of the mixed numbers.

From such examples as the above, we get this rule:

To add mixed numbers, add the fractions, reducing the result if possible; next add the integers; and then add the results.

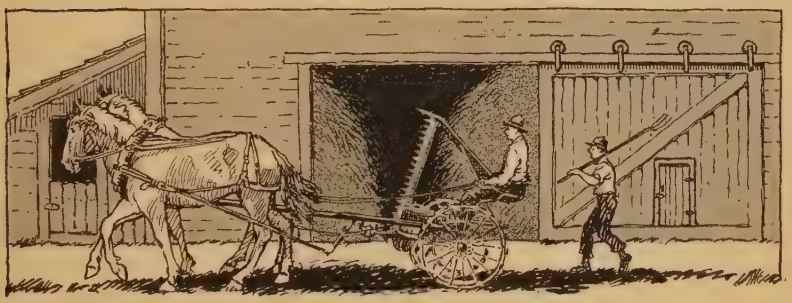
Without using pencil, add.

1. $3\frac{1}{2}$	3. $6\frac{1}{2}$	5. $9\frac{3}{4}$	7. $17\frac{1}{9}$	9. $7\frac{5}{12}$
12	$14\frac{1}{2}$	$10\frac{1}{4}$	$4\frac{5}{9}$	$18\frac{5}{12}$
2. $10\frac{1}{5}$	4. $15\frac{1}{8}$	6. $16\frac{1}{6}$	8. $13\frac{7}{10}$	10. $16\frac{3}{8}$
$8\frac{3}{5}$	$7\frac{3}{8}$	$8\frac{1}{6}$	$11\frac{1}{10}$	$12\frac{3}{8}$

Add.

1. $27\frac{2}{3}$	2. $67\frac{5}{8}$	3. $83\frac{1}{3}$	4. $45\frac{3}{5}$	5. $25\frac{1}{4}$
$18\frac{2}{3}$	$45\frac{3}{4}$	$81\frac{4}{9}$	$68\frac{7}{10}$	$79\frac{5}{6}$
6. $12\frac{3}{4}$	7. $16\frac{2}{3}$	8. $31\frac{1}{8}$	9. $17\frac{2}{3}$	10. $28\frac{1}{2}$
$15\frac{1}{2}$	$23\frac{1}{6}$	$25\frac{1}{2}$	$34\frac{1}{6}$	$19\frac{7}{10}$
$18\frac{1}{4}$	$41\frac{2}{3}$	$42\frac{3}{4}$	$26\frac{1}{2}$	$35\frac{4}{5}$
11. $42\frac{1}{3}$	12. $43\frac{2}{3}$	13. $74\frac{1}{6}$	14. $127\frac{1}{2}$	15. $623\frac{1}{2}$
$27\frac{1}{6}$	$48\frac{5}{9}$	$26\frac{1}{3}$	$395\frac{3}{4}$	$761\frac{9}{10}$
$35\frac{3}{4}$	$39\frac{1}{6}$	$55\frac{5}{9}$	$486\frac{5}{6}$	$488\frac{3}{5}$

See pages 306 and 307 for additional drill examples.



At Mr. Brown's Farm

1. Mr. Brown has a farm of $64\frac{1}{2}$ acres. He is going to buy $10\frac{3}{4}$ acres more. How large will his farm be then?

2. In one day Mr. Brown can mow $\frac{2}{3}$ of a field. His son can mow $\frac{1}{4}$ of it. What part of it can both cut in a day?

3. Into a bin containing $7\frac{5}{8}$ barrels of apples, Mr. Brown put $2\frac{3}{4}$ barrels. How many barrels of apples were in the bin?

4. Mr. Brown has $1\frac{1}{3}$ acres of wood land on one part of his farm, $2\frac{1}{2}$ acres on another part, and $3\frac{1}{4}$ acres on another part. How many acres of wood land has he?

A Shopping Trip

One Saturday afternoon Margaret Thompson went on a shopping trip with her mother.

1. The car fare is 7¢. How much did it cost for Margaret and her mother to ride downtown and back?

2. At a shoe store Mrs. Thompson bought Margaret a pair of shoes for $3.25, giving the clerk a $5 bill. How much change did she receive?

3. In another store Mrs. Thompson bought one piece of silk $1\frac{1}{2}$ yards long and another piece $2\frac{1}{4}$ yards long. How much silk did she buy there?

4. In that store Mrs. Thompson saw a sweater for Margaret for $6.50. In another store there was a sweater of the same kind for $4.98. How much would she save by buying at the second store?

5. Margaret had $3\frac{3}{4}$ yards of narrow blue ribbon at home and she bought $4\frac{5}{8}$ yards more. How much did she have then?

6. At Johnson and Murray's Mrs. Thompson bought nine yards of cloth at $.39 a yard. How much did this amount to? She paid with a $10 bill. Find the amount of her change.

7. At Forbes and Wallace's Mrs. Thompson bought goods at these prices: $1.98, $2.15, $.79, $4.50, and $12. Find the cost of these goods.

8. On the way home Margaret and her mother stopped at the grocery and bought $1\frac{1}{2}$ pounds of best butter and $1\frac{7}{8}$ pounds of cooking butter. How much butter did they buy?

SUBTRACTION OF FRACTIONS

Subtraction of Like Fractions

Working with the diagrams we found that:

$\frac{3}{5}-\frac{1}{5}=\frac{2}{5}$ $\frac{7}{8}-\frac{1}{8}=\frac{6}{8}=\frac{3}{4}$ $\frac{3}{10}-\frac{1}{10}=\frac{2}{10}=\frac{1}{5}$

From such examples as these, we get this rule:

To subtract like fractions, subtract the numerators and place the result over the common denominator. Reduce the resulting fraction if possible.

1. $\frac{3}{4}-\frac{1}{4}$	6. $\frac{5}{9}-\frac{2}{9}$	11. $\frac{4}{15}-\frac{2}{15}$	16. $\frac{7}{10}-\frac{1}{10}$
2. $\frac{4}{5}-\frac{1}{5}$	7. $\frac{8}{9}-\frac{1}{9}$	12. $\frac{7}{15}-\frac{2}{15}$	17. $\frac{9}{10}-\frac{1}{10}$
3. $\frac{1}{8}-\frac{1}{8}$	8. $\frac{3}{10}-\frac{1}{10}$	13. $\frac{5}{6}-\frac{1}{6}$	18. $\frac{11}{12}-\frac{1}{12}$
4. $\frac{7}{8}-\frac{3}{8}$	9. $\frac{7}{12}-\frac{1}{12}$	14. $\frac{7}{8}-\frac{1}{8}$	19. $\frac{7}{8}-\frac{3}{8}$
5. $\frac{5}{9}-\frac{4}{9}$	10. $\frac{11}{12}-\frac{5}{12}$	15. $\frac{8}{9}-\frac{2}{9}$	20. $\frac{15}{16}-\frac{11}{16}$

Subtraction of Unlike Fractions

$\frac{5}{6}-\frac{7}{12}=?$

$\frac{5}{6}=\frac{10}{12}$

$\frac{7}{12}=\frac{7}{12}$

$\frac{3}{12}=\frac{1}{4}$

To subtract unlike fractions, reduce them to fractions having the least common denominator and then subtract the like fractions. Reduce the result if possible.

Subtract.

1. $\frac{3}{4}$	4. $\frac{1}{2}$	7. $\frac{1}{2}$	10. $\frac{5}{6}$	13. $\frac{3}{4}$
$\frac{1}{2}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{1}{2}$	$\frac{1}{12}$
2. $\frac{5}{6}$	5. $\frac{1}{2}$	8. $\frac{9}{10}$	11. $\frac{11}{12}$	14. $\frac{1}{2}$
$\frac{2}{3}$	$\frac{5}{12}$	$\frac{4}{5}$	$\frac{2}{3}$	$\frac{1}{10}$
3. $\frac{5}{8}$	6. $\frac{9}{16}$	9. $\frac{11}{16}$	12. $\frac{2}{3}$	15. $\frac{4}{5}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{9}$	$\frac{1}{2}$

See page 308 for additional drill examples.

Subtraction of Mixed Numbers

I. When the fraction in the minuend is larger than the fraction in the subtrahend:

$24\frac{5}{6}$	$\frac{10}{12}$
$-\ 15\frac{1}{4}$	$\frac{3}{12}$
$9\frac{7}{12}$	

First subtract the fractions and then the integers.

Subtract.

1. $25\frac{3}{4}$	**4.** $45\frac{3}{10}$	**7.** $51\frac{2}{3}$	**10.** $62\frac{7}{12}$	**13.** $60\frac{2}{3}$
15	$20\frac{1}{10}$	$19\frac{5}{12}$	$28\frac{1}{6}$	$24\frac{1}{6}$
2. $17\frac{5}{8}$	**5.** $14\frac{3}{8}$	**8.** $37\frac{4}{5}$	**11.** $49\frac{1}{2}$	**14.** $54\frac{1}{2}$
$\frac{1}{8}$	$9\frac{1}{4}$	$10\frac{3}{10}$	$15\frac{1}{5}$	$14\frac{1}{3}$
3. $39\frac{3}{4}$	**6.** $29\frac{5}{6}$	**9.** $49\frac{7}{12}$	**12.** $75\frac{1}{4}$	**15.** $61\frac{3}{4}$
$\frac{1}{2}$	$14\frac{1}{3}$	$21\frac{1}{4}$	$31\frac{1}{6}$	$39\frac{2}{5}$

II. When the minuend is an integer or when the fraction of the minuend is less than the fraction of the subtrahend:

A.
$$\begin{array}{rl} 7 &= 6\frac{3}{3} \\ -\ 2\frac{1}{3} &= 2\frac{1}{3} \\ \hline & 4\frac{2}{3} \end{array}$$

We take one whole from 7, leaving 6. Then we think of this one whole as $\frac{3}{3}$. Thus $7 = 6\frac{3}{3}$. The difference is $4\frac{2}{3}$.

B.
$$\begin{array}{rl} 19\frac{1}{4} &= 19\frac{3}{12} = 18\frac{15}{12} \\ -\ 10\frac{2}{3} &= 10\frac{8}{12} = 10\frac{8}{12} \\ \hline & 8\frac{7}{12} \end{array}$$

When we change the fractions to twelfths, we have $\frac{3}{12}$ in the minuend and $\frac{8}{12}$ in the subtrahend. We cannot subtract $\frac{8}{12}$ from $\frac{3}{12}$, so we think $19 = 18\frac{12}{12}$. $18\frac{12}{12}$ with the $\frac{3}{12}$ makes $18\frac{15}{12}$. We can now subtract, as in *A*, getting $8\frac{7}{12}$ as the difference.

$19\frac{1}{4}$	$\frac{15}{12}$
$10\frac{2}{3}$	$\frac{8}{12}$
$8\frac{7}{12}$	

After some practice, the written work of example *B*, on page 66, can be shortened to this form.

Subtract.

1. 9	**5.** $12\frac{1}{2}$	**9.** $36\frac{1}{2}$	**13.** $52\frac{1}{4}$	**17.** $91\frac{1}{6}$
$5\frac{1}{2}$	$\frac{5}{8}$	$14\frac{7}{10}$	$17\frac{5}{6}$	$80\frac{4}{9}$
2. 12	**6.** $15\frac{2}{3}$	**10.** $62\frac{1}{4}$	**14.** $30\frac{3}{8}$	**18.** $72\frac{1}{2}$
$4\frac{2}{3}$	$\frac{5}{6}$	$23\frac{5}{12}$	$12\frac{3}{4}$	$65\frac{5}{8}$
3. 21	**7.** $18\frac{1}{4}$	**11.** $89\frac{1}{2}$	**15.** $29\frac{1}{6}$	**19.** $86\frac{1}{2}$
$7\frac{2}{5}$	$\frac{4}{5}$	$75\frac{2}{3}$	$28\frac{1}{2}$	$25\frac{3}{5}$
4. $16\frac{1}{6}$	**8.** $27\frac{1}{2}$	**12.** $47\frac{2}{3}$	**16.** $71\frac{3}{8}$	**20.** $64\frac{1}{8}$
$\frac{5}{6}$	$16\frac{3}{4}$	$16\frac{3}{4}$	$50\frac{7}{16}$	$43\frac{1}{2}$

See pages 309 and 310 for additional drill examples.

PROBLEMS

1. From a piece of cloth $\frac{5}{8}$ yd. long, a piece $\frac{1}{4}$ yd. long is cut. How much is left?

2. Mrs. Bennett bought $3\frac{7}{8}$ yd. of silk and then had to buy $1\frac{3}{4}$ yd. more. How much silk did she buy in all?

3. A man walks $\frac{5}{6}$ of a mile to the car line and then rides $2\frac{1}{4}$ miles to work. How far is it from his home to work?

4. A flagpole $28\frac{1}{4}$ ft. long was set in the ground $4\frac{1}{2}$ ft. How much of the pole was above ground?

5. At the store Margaret bought $2\frac{1}{8}$ lb. of meat and $1\frac{3}{4}$ lb. of butter. How many pounds of provisions was this?

Outdoor Life

1. It takes Ralph $12\frac{1}{2}$ seconds to run a certain distance which Harold runs in $9\frac{4}{5}$ seconds. Find the difference in seconds.

2. Ralph and Harold went on a hike of $5\frac{3}{4}$ mi. to a camp and $6\frac{1}{2}$ mi. back. How long was the hike?

3. One morning the boys started to build a chicken run. They had on hand $15\frac{5}{6}$ yd. of chicken wire and found that they would need $20\frac{1}{4}$ yd. How much must they buy?

4. It takes the boys 10 min. to walk to the ball field and they can ride to it on their bicycles in $4\frac{1}{2}$ min. How much time is saved by riding?

5. One day the boys went on an automobile trip, starting with $7\frac{5}{8}$ gal. of gasoline and ending with $2\frac{3}{4}$ gal. How much gasoline did they use?

6. One Saturday afternoon they took a three-hour bicycle trip, riding $10\frac{1}{5}$ mi. the first hour, $7\frac{3}{10}$ mi. the second hour, and $6\frac{1}{2}$ mi. the third hour. How long was the trip?

7. Last summer Harold and Ralph went 40 miles to a camp. They went $23\frac{1}{2}$ mi. on the train, $14\frac{3}{4}$ mi. in an automobile, and walked the rest of the way. How far did they walk?

8. One morning four of the boys caught $9\frac{1}{4}$ lb. of fish. One boy caught $1\frac{1}{2}$ lb.; another boy, $2\frac{3}{4}$ lb.; and a third boy, $2\frac{5}{8}$ lb. How much did the fourth boy catch?

9. The boys are building a 100-yd. cinder track. They made $36\frac{1}{2}$ yd. of it last week and $40\frac{3}{4}$ yd. this week. How much have they still to do?

A Halloween Party

1. Mary Wilson had a Halloween party and there were 30 children present. Two thirds of the children were girls. How many girls were at the party?

2. Helen Brown came the longest distance to the party. She had to ride $2\frac{3}{4}$ miles on the trolley and $9\frac{3}{4}$ miles on a train. How many miles did she come?

3. Mrs. Wilson bought two pounds of cookies at 35¢ a pound and three dozen cakes at 25¢ a dozen. How much did she pay for the cookies and cakes?

4. Mary wanted $5\frac{1}{2}$ pounds of candy for the party. Mrs. Wilson made $1\frac{3}{4}$ pounds of this and bought the rest. How much candy did she buy?

5. The children played a peanut hunt game. Mrs. Wilson had hidden 250 peanuts. During the hunt 198 peanuts were found. How many still remained hidden?

6. Mrs. Wilson made 6 quarts of ice cream. She estimated that it cost her 40¢ a quart. At the store it is 55¢ a quart. How much did she save by making the ice cream?

7. After the party there was $\frac{1}{2}$ quart of ice cream left. How much ice cream had been eaten?

CHAPTER REVIEWS

PROCESS REVIEW

1. What does the denominator of a fraction show? What does the numerator show?

2. How can you tell a proper fraction? an improper fraction? a mixed number?

3. What can we do to both numerator and denominator of a fraction without changing the value of the fraction?

4. What does reducing to lowest terms mean? How do you do it? What does reducing to higher terms mean? How do you do it?

5. Why do we reduce fractions to their lowest terms? In what kinds of examples do we reduce fractions to higher terms?

6. How do you reduce an improper fraction to a mixed number?

7. What are like fractions? unlike fractions?

8. How do you add like fractions?

9. How do you find the least common denominator of several fractions?

10. How do you reduce unlike fractions to fractions having the least common denominator?

11. How do you add unlike fractions?

12. How do you add mixed numbers?

13. How do you subtract like fractions? unlike fractions?

14. How do you subtract mixed numbers? What do you do when the minuend is a whole number or when the

fraction in the subtrahend is larger than the fraction in the minuend?

15. In all examples in addition and subtraction of fractions, what should be done to the result when possible?

ORAL EXERCISES

1. Multiply the following by 10; by 100; by 1,000.

8 37 5 26 3 54 124 250

2. Read these fractions and tell the meaning of each.

$\frac{1}{6}$ $\frac{3}{8}$ $\frac{7}{10}$ $\frac{2}{5}$ $\frac{11}{12}$ $\frac{4}{15}$ $\frac{13}{18}$ $\frac{17}{20}$

3. Give the correct name for each of these numbers.

$\frac{8}{5}$ 26 $\frac{3}{7}$ $\frac{2}{9}$ $7\frac{1}{3}$ $\frac{6}{6}$ $10\frac{3}{4}$

Reduce these fractions.

4. $\frac{1}{2}=\frac{?}{4}=\frac{?}{8}=\frac{?}{16}$ $\frac{1}{3}=\frac{?}{6}=\frac{?}{12}$ $\frac{2}{5}=\frac{?}{10}=\frac{?}{20}$ $\frac{5}{6}=\frac{?}{12}=\frac{?}{18}$ $\frac{6}{8}=\frac{?}{4}$

5. $\frac{8}{10}=\frac{?}{5}$ $\frac{8}{12}=\frac{?}{3}$ $\frac{9}{15}=\frac{?}{5}$ $1=\frac{?}{3}$ $1=\frac{?}{4}$ $1=\frac{?}{5}$ $1=\frac{?}{6}$ $1=\frac{?}{8}$

6. $\frac{11}{2}$ $\frac{9}{4}$ $\frac{17}{5}$ $\frac{18}{6}$ $\frac{22}{3}$ $\frac{28}{7}$ $\frac{14}{9}$ $\frac{38}{7}$

7. *a.* $\frac{1}{6}+\frac{1}{6}$ *c.* $\frac{7}{8}+\frac{3}{8}$ *e.* $\frac{9}{10}+\frac{1}{5}$

b. $\frac{2}{5}+\frac{3}{5}$ *d.* $\frac{5}{8}+\frac{1}{8}$ *f.* $\frac{2}{3}+\frac{1}{2}$

DRILL EXAMPLES

1. Add.

673
421
809
347
688
112
455
826
537

2. Add.

407
772
390
516
282
349
186
853
591

3. Write in Roman numerals: 24, 75, 43, 115.

4. Subtract.

70,235
32,671

5. Subtract.

$3,182.19
1,730.25

6. $509 \times 8{,}362$ $470 \times 6{,}900$ $7{,}134 \times 562$

7. $17{,}556 \div 57$ $137{,}460 \div 316$ $196{,}218 \div 264$

8. Reduce these fractions to their lowest terms.

$\frac{16}{18}$ $\frac{12}{14}$ $\frac{21}{27}$ $\frac{27}{36}$ $\frac{36}{64}$ $\frac{48}{72}$ $\frac{45}{75}$

9. Reduce these improper fractions to mixed numbers.

$\frac{79}{9}$ $\frac{84}{5}$ $\frac{161}{12}$ $\frac{222}{8}$ $\frac{489}{15}$

10. *a.* $\frac{1}{12}+\frac{7}{12}+\frac{1}{12}$ *c.* $\frac{9}{20}+\frac{7}{20}+\frac{19}{20}$

b. $\frac{4}{15}+\frac{8}{15}+\frac{13}{15}$ *d.* $\frac{5}{18}+\frac{17}{18}+\frac{11}{18}$

11. *a.* $\frac{3}{4}+\frac{1}{2}+\frac{1}{6}$ *b.* $\frac{1}{3}+\frac{13}{15}+\frac{4}{5}$ *c.* $\frac{5}{6}+\frac{3}{4}+\frac{2}{3}$ *d.* $\frac{1}{6}+\frac{2}{3}+\frac{7}{9}$

12. *a.* $49\frac{2}{3}+62\frac{1}{6}+15\frac{2}{9}$ *b.* $17\frac{3}{8}+50\frac{5}{16}+26\frac{3}{4}$

Subtract.

13. *a.* $\frac{7}{10}-\frac{2}{5}$ *b.* $\frac{5}{6}-\frac{2}{9}$ *c.* $\frac{3}{4}-\frac{2}{5}$ *d.* $24\frac{8}{9}-11\frac{2}{3}$ *e.* $32-15\frac{3}{4}$ *f.* $48\frac{1}{4}-17\frac{9}{10}$

GENERAL PROBLEMS

1. Joe's arithmetic is $\frac{7}{8}$ inch thick, his reader $1\frac{1}{4}$ inches, and his history $1\frac{1}{2}$ inches. How high are these books when piled together?

2. From a gas pipe $17\frac{1}{2}$ feet long a workman cuts off $6\frac{2}{3}$ feet. How much of the pipe is left?

3. Mr. Brown's coal came in four loads, as follows: $2\frac{1}{3}$ tons, $2\frac{1}{2}$ tons, $2\frac{5}{6}$ tons, $2\frac{1}{3}$ tons. How much coal did he receive?

4. Two boys started out to hike to a town 14 miles away. In the morning they walked $7\frac{1}{3}$ miles; and in the afternoon $4\frac{3}{4}$ miles. What distance must they walk in the evening?

5. A tub contains 22 lb. of butter. After the grocer sells from it $1\frac{1}{2}$ lb., $2\frac{3}{4}$ lb., and $\frac{7}{8}$ lb., how much butter is left?

GENERAL TESTS

I

1. 785×269
2. Reduce $\frac{12}{16}$ to lowest terms.
3. Change $\frac{5}{6}$ to eighteenths.
4. $\frac{1}{2}+\frac{2}{3}$
5. Add. $28\frac{1}{4}$, $41\frac{5}{8}$
6. Take $\frac{1}{6}$ from $\frac{3}{4}$.

II

1. Divide 154,062 by 634.
2. What number is LXIX?
3. Reduce $\frac{116}{15}$ to a mixed number.
4. $\frac{1}{3}+\frac{5}{6}+\frac{1}{2}$
5. Subtract. $63\frac{1}{5}$ from $42\frac{3}{4}$
6. Add. $57\frac{2}{3}$, $26\frac{3}{4}$, $17\frac{5}{6}$

III

1. Add.

	6,208
	765
	1,232
	57
	463
	5,718
	82
	515

2. 568×136
3. $\frac{4}{5}+\frac{1}{2}-\frac{3}{10}$
4. From $26\frac{2}{3}$ take $17\frac{7}{9}$.
5. Divide the sum of 12,287 and 10,635 by 314.

6. Four stakes are set in the ground in a straight line. The distance from the first stake to the second is $18\frac{2}{3}$ ft.; from the second to the third is $14\frac{1}{2}$ ft.; from the third to the fourth is $16\frac{3}{4}$ ft. How far is the fourth stake from the first?

IV

1. $\frac{3}{4}+\frac{1}{2}-\frac{3}{8}$

2. Add. $35\frac{7}{10}$, $61\frac{3}{5}$

3. Subtract. $41\frac{1}{4}$ from $24\frac{5}{6}$

4. Take $20\frac{1}{2}$ from the sum of $19\frac{2}{3}$ and $14\frac{3}{4}$.

5. From a line $6\frac{1}{2}$ inches long $1\frac{3}{4}$ inches is erased. How much of the line is left?

V

1. Find the average of these lengths: 28 ft., 19 ft., 23 ft., 17 ft., 31 ft., 26 ft.

2. Subtract 2,809 from 3,204 and multiply the result by 75.

3. From a pile of books $16\frac{1}{2}$ inches high a book $1\frac{3}{4}$ inches thick was taken. How high was the pile of books then?

4. A chapter in a big book is headed, "Chapter XLII." Write the number of the chapter in Arabic numerals.

5. Add $15\frac{3}{8}$, $16\frac{1}{2}$, $17\frac{7}{8}$, $25\frac{1}{4}$.

6. It takes 365 days to make a year. About how many years are there in 20,440 days?

CHAPTER III

UNITED STATES MONEY; USEFUL MEASURES

10 mills	=	1 cent
10 cents	=	1 dime
10 dimes	=	1 dollar

United States Money

Name the coins in common use in this country.

The mill is used in numerical work, but it is not coined.

We have also paper money or bills. This paper money has little value of itself, but it is of value because it represents real silver and gold money which will be paid in exchange for the bills if their owner desires.

Name the bills in common use.

In business, part of a cent is considered a whole cent. Thus, $12\frac{1}{2}¢$ is considered 13¢.

Making Change

1. How much change would you receive if you made the following purchases and gave the clerk 25¢?

10¢ 16¢ 8¢ 19¢ 9¢ 12¢ 21¢

2. Name the change from 50¢ with the following purchases:

30¢ 25¢ 12¢ 18¢ 14¢ 31¢ 28¢

3. Name the change from \$1 with the following purchases:

85¢ \$.81 77¢ 42¢ 28¢ 66¢ \$.14

4. Name the change from \$2 with the following purchases:

\$1.75 \$1.10 \$1.45 75¢ \$1.32 84¢ \$1.89

Addition and Subtraction of United States Money

In writing amounts of money for addition or subtraction, be sure to place the decimal points and the corresponding figures of dollars and cents in columns.

Add the following amounts and check the results.

1. \$138.18	**3.** \$215.35	**5.** \$316.19	**7.** \$2,432.60
27.40	37.72	721.46	1,361.05
42.15	190.05	9.08	723.14
264.39	332.14	532.40	6,245.37
80.56	80.61	116.15	4,507.20
	418.20	600.86	462.36
2. \$ 49.53	**4.** \$516.20	**6.** \$705.05	**8.** \$7,267.53
260.18	80.35	283.24	2,356.28
35.40	171.64	161.11	1,902.15
672.03	57.96	45.33	514.02
54.64	415.09	829.89	6,480.51
	218.57	716.41	2,057.18

Subtract.

1. \$453.48	**3.** \$734.19	**5.** \$406.08	**7.** \$700.00
21.76	62.80	124.65	197.80
2. \$560.94	**4.** \$214.03	**6.** \$700.43	**8.** \$975.02
134.76	108.76	253.51	468.58

PROBLEMS

1. John started a bank account. In April he put \$2.50 in the bank; in May, \$1.75; in June, \$2; in July, \$3.15; in August, \$3.60. How much did he put in the bank?

2. In September John drew out \$1.50. How much did he then have in the bank?

3. During one month Richard earned 75¢ running errands, \$5.50 selling papers, and \$1.45 in other ways. He spent \$2.15 that month. How much was left to put in the bank?

4. In the last three months Richard has put aside these amounts toward a \$5 camera: \$1.12, \$.75, \$1.49. How much more does he need?

5. John's father bought a lot for \$735 and built on it a bungalow which cost \$4,826. What was the cost of the house and lot?

6. After making one payment of \$325 and one of \$150, how much did he then owe on the lot?

7. A real-estate dealer took in \$435 one month by renting apartments. Out of this he paid \$70 for office rent, \$72 for office help, and \$6.80 for other expenses. How much had he left that month?

Multiplication of United States Money

A.	*B.*	*C.*
\$231	\$.67	\$32.43
16	24	32
1386	268	6486
231	134	9729
\$3,696	\$16.08	\$1,037.76

Notice that in examples *B* and *C* the decimal point is used in the products to show which numbers mean *cents*.

Find the following products.

1. 8 × \$ .45	**5.** 18 × \$426	**9.** 734 × \$214.38
2. 16 × \$ .30	**6.** 35 × \$ 64.55	**10.** 45 × \$300.05
3. 7 × \$ .39	**7.** 43 × \$180.50	**11.** 688 × \$481.26
4. 12 × \$1.76	**8.** 206 × \$ 5.12	**12.** 304 × \$623.15

Multiplication by 10; 100; 1,000

\$2.36	\$3.25	\$6.84
10	100	1,000
\$23.60	\$325.00	\$6,840.00

To multiply United States money
by 10, move the decimal point one place to the right;
by 100, move the decimal point two places to the right;
by 1,000, move the decimal point three places to the right.

Annex zeros when necessary.

(Without pencil)

1. 10 × \$8.27	**4.** 10 × \$16.51	**7.** 100 × \$46.
2. 10 × \$ .46	**5.** 100 × \$ 4.16	**8.** 1,000 × \$ 4.00
3. 10 × \$ .93	**6.** 100 × \$ .31	**9.** 1,000 × \$ 2.50

Division of United States Money

```
        $4.36
74)$322.64
    296
     266
     222
      444
      444
```

United States money is divided by integers in the same way that ordinary numbers are. Be sure to put a decimal point in the quotient directly over the decimal point in the dividend.

1. $86.25 ÷ 23	5. $154.28 ÷ 38	9. $6,065.38 ÷ 173
2. $92.48 ÷ 16	6. $338.56 ÷ 16	10. $21,824. ÷ 352
3. $63.02 ÷ 46	7. $1,093.30 ÷ 26	11. $19,074. ÷ 264
4. $45.36 ÷ 63	8. $2,695.88 ÷ 44	12. $17,159.52 ÷ 336

Earning Money

1. Arthur sold 32 books last summer and made $1.05 on each book. How much money did he make?

2. Mary keeps hens. Last month she sold 18 dozen eggs at 47¢ a dozen. How much money did she receive?

3. At a girls' club entertainment, 72 persons bought tickets at 35¢ apiece. How much money was taken in?

4. The expenses were $1.75 for tickets, $2.30 for programs, and $2.82 for decorations. How much did the girls make?

5. John raised 17 bushels of potatoes which he sold at $1.25 a bushel. How much money did he receive?

6. With part of the money he bought a crystal radio set for $9.75, and extra wire and parts for $1.50. How much of his money was left?

7. Jack works in a grocery on Friday afternoon and Saturday and earns $1.75 a week. How much does he earn in 36 weeks?

8. Last Saturday he sold Mrs. Brown 5 lb. butter at 42¢ a pound, 7 doz. eggs at 40¢ a dozen, and 3 bu. potatoes at $1.25 a bushel. Find the cost of these groceries.

9. Mrs. Brown paid for her groceries with a $10 bill. How much change did she receive?

Sending Money Orders

As a rule, it is not wise to send by mail money either in bills or coins. It is much better to use a money order, which can be obtained at your post office. For a small fee, a money order will be made out for you, payable to another person or firm. You can send this order safely in your letter. The one who receives the money order takes it to the post office in his own city and is paid the amount stated on the order.

The fees for sending money by postal money order vary according to the amount of money which is sent.

Orders from	$ .01	to	$ 2.50	cost 3 cents.
Orders from	2.51	to	5.00	cost 5 cents.
Orders from	5.01	to	10.00	cost 8 cents.
Orders from	10.01	to	20.00	cost 10 cents.
Orders from	20.01	to	30.00	cost 12 cents.
Orders from	30.01	to	40.00	cost 15 cents.
Orders from	40.01	to	50.00	cost 18 cents.

PROBLEMS

1. Name the fees for sending the following amounts by postal money order.

$1.25	$7.50	$8.75	$ 1.35	$ .95
$2.50	$4.60	$5.10	$25.50	$15.80

2. What is the total amount, including the fee, that must be given to the clerk to get money orders for each of the following amounts?

$ .80	$1.50	$ 5.90	$2.25	$ 5.00
$1.75	$6.30	$10.40	$8.50	$20.90

3. Fred wishes to send a money order for $3 to pay for a scout duffel bag. What is the total amount of money he must give the clerk?

4. Mary is going to send a money order to pay for some ice skates that cost $2.40. What will be the total cost?

5. John bought a tennis racket that cost $5.50. He sent a money order to pay for it. How much did he give the postal clerk?

6. Grace sent a money order for $1.50 to pay for a magazine. She gave the clerk $2. How much change did she receive?

7. During his vacation Walter sold kitchen ware which cost $31.45. He paid for this by money order, giving the clerk three ten-dollar bills and a five-dollar bill. How much change did he receive?

8. Mr. Brown paid for $17.50 worth of seeds by money order, giving the clerk $20. How much change did he receive?

LOCAL PROBLEMS

Find out and fill in local prices and amounts for the following problems. After the reports are in, the class should agree on the figures to be used and then solve the problems.

1. What is the cost of 2 lb. of butter at —— a pound; 3 lb. of crackers at —— a pound; and 2 qt. of molasses at —— a quart?

2. If a $5 bill is given to pay for the above purchases, how much change will be received?

3. Find the cost of 7 yd. of silk at —— a yard, 3 yd. of linen at —— a yard, and 4 yd. of lace at —— a yard.

4. If your school should order 50 arithmetics, 25 geographies, and 75 reading books, what would be the total cost?

5. Find the cost of 25 pairs of roller skates at —— a pair.

6. How much will 5 coaster wagons cost?

7. What will be the cost of a croquet set, a girl's tennis racket, and six tennis balls?

8. Charles Spellman worked 27 hours for Mr. Johnson at —— an hour. How much did he receive for his work?

9. Find the cost of the following goods sent from a market to a boarding house.

9 lb. of beef at —— a pound.
25 lb. of sugar at —— a pound.
5 bottles of olives at —— a bottle.
7 lb. of bacon at —— a pound.
1 barrel of apples at —— a barrel.

USEFUL MEASURES

Liquid Measure

Liquid measure is used in measuring milk, oils, gasoline, vinegar, and other liquids.

4 gills (gi.)	= 1 pint (pt.)
2 pints	= 1 quart (qt.)
4 quarts	= 1 gallon (gal.)

(Without pencil)

1. 3 qt. = ? pt.
2. 4 gal. = ? qt.
3. 2 gal. = ? pt.
4. 10 pt. = ? qt.
5. 40 pt. = ? gal.
6. 11 pt. = ? qt. ? pt.
7. 15 qt. = ? gal. ? qt.
8. 32 pt. = ? qt. ? gal.
9. Which is the greater amount, 15 pt. or 8 qt.? How much greater?
10. Which is the greater amount, 21 qt. or 5 gal.? How much greater?

Change 16 gal. 3 qt. to quarts.

16 — 1 gal. = 4 qt.
4 — 16 gal. = 16 × 4 qt. = 64 qt.
64 — 64 qt. + 3 qt. = 67 qt.
3
67 qt. — 16 gal. 3 qt. = 67 qt.

1. Change 23 gal. 2 qt. to quarts.
2. Change 18 qt. 1 pt. to pints.
3. Change 3 gal. 3 qt. to pints.
4. Change 5 gal. 1 pt. to pints.

5. A pail holds 2 gal. of milk. How many quarts does it hold?

6. Six gallons of olive oil are to be put into pint bottles. How many bottles are necessary?

Change 147 qt. to gallons and quarts.

$$4\overline{)147}\quad 36\ \tfrac{3}{4}$$

As there are 4 qt. in 1 gal., we divide 147 qt. by 4 to get the number of gallons, which is 36.

There is a remainder of 3 qt. Hence: 147 qt. = 36 gal. 3 qt.

7. Change 113 qt. to gallons and quarts.

8. Change 215 pt. to quarts and pints.

9. Change 187 pt. to quarts and pints.

10. Change 124 pt. to gallons and quarts.

Milk Problems

1. When milk is 12¢ a quart, what is the price per gallon?

2. From a 10-gal. can of milk a farmer fills 45 pint bottles. How many pints of milk are left in the can? How many quarts and pints?

3. A family uses 2 qt. of milk a day. Express in gallons and quarts the amount they use in a week.

4. How much is 84 qt. of milk worth at the wholesale rate of 40¢ a gallon?

5. What is the cost of 8 gal. 3 qt. of milk at 12¢ a quart?

Dry Measure

Dry measure is used for measuring potatoes, apples, grain, berries, and other dry articles.

2 pints (pt.)	= 1 quart (qt.)
8 quarts	= 1 peck (pk.)
4 pecks	= 1 bushel (bu.)

For many products the bushel is reckoned by weight. In most states a bushel of potatoes is 60 pounds; of wheat, 60 pounds; and of shelled corn, 56 pounds.

1. 4 qt. = ? pt.
2. 8 pk. = ? qt.
3. 5 bu. = ? pk.
4. 12 pt. = ? qt.
5. 24 qt. = ? pk.
6. 32 pt. = ? pk.
7. 25 qt. = ? pk. ? qt.
8. 18 pk. = ? bu. ? pk.

9. Which is the greater amount, 3 pk. or 30 qt.? How much greater?

Change 27 bu. 2 pk. to pecks.

27	1 bu. = 4 pk.
4	27 bu. = 27 × 4 pk. = 108 pk.
108	108 pk. + 2 pk. = 110 pk.
2	
110 pk.	27 bu. 2 pk. = 110 pk.

1. Change 19 bu. 3 pk. to pecks; 9 pk. 7 qt. to quarts.
2. Change 5 bu. 3 pk. to quarts; 6 bu. 1 qt. to quarts.
3. A dealer put 5 pk. 6 qt. of strawberries into quart boxes. How many boxes were needed?

Change 103 qt. to pecks and quarts.

$$8\overline{)103}\quad 12\frac{7}{}$$

As there are 8 qt. in 1 pk., we divide the 103 qt. by 8. This gives 12, the number of pecks, and a remainder of 7 qt. Hence: 103 qt. = 12 pk. 7 qt.

1. Change 103 pk. to bushels and pecks.
2. Change 126 qt. to pecks and quarts.
3. Change 112 qt. to bushels and pecks.
4. At different times Wallace picked $4\frac{1}{2}$ pk., $4\frac{1}{4}$ pk., $3\frac{1}{2}$ pk., and $3\frac{3}{4}$ pk. of crab apples from his tree. He sold them at \$2 a bushel. How much did he receive for them?
5. Stanley has an order from his grocer for 2 pk. of chestnuts. On different days he gathered 3 qt., $1\frac{1}{2}$ qt., 2 qt., $3\frac{1}{2}$ qt., and $2\frac{1}{2}$ qt. How many quarts has he still to gather?

Measures of Time

60 seconds (sec.)	= 1 minute (min.)
60 minutes	= 1 hour (hr.)
24 hours	= 1 day (da.)
7 days	= 1 week (wk.)
52 weeks	= 1 year (yr.), nearly
12 months (mo.)	= 1 year
365 days	= 1 common year
366 days	= 1 leap year

Any year whose number is divisible by 4 is a leap year, except one ending in two zeros. To be a leap year, such a year must be divisible by 400. 1600, 1896, 1928 are leap years.

Thirty days hath September,
April, June, and November.

The other months have 31 days, except February, which has 28 days in common years and 29 days in leap years.

In giving clock time, M. means *noon*, A.M. means *before noon*, P.M. means *after noon*. 12 M. is 12 o'clock noon; 3:15 P.M. is quarter past three in the afternoon.

PROBLEMS

1. What is the total number of days in June, July, August? In September, October, November?

2. It took a ship 6 days to cross the Atlantic. How many hours did it travel?

3. Helen practices $\frac{1}{2}$ hr. a day on the piano. How many hours did she practice in April, counting out four Sundays?

4. How many hours are there from 8 A.M. until noon? From 9 A.M. to 4 P.M.?

5. How many days are in 5 years, two of which are leap years?

6. A carpenter worked from 8 A.M. to 12 M. and from 1 P.M. to 5 P.M. and received $7.20. How much did he earn per hour?

7. A watch gained 3 seconds a day during June. How many minutes and seconds was it ahead of the correct time at the end of the month?

8. One week Grace helped her mother 20 minutes in the morning and 25 minutes in the evening on each school day. How many hours and minutes did this make in all?

12 units	= 1 dozen (doz.)	24 sheets of paper	= 1 quire
12 dozen 144 units	= 1 gross	20 quires 480 sheets	= 1 ream*
20 units	= 1 score		

(Without pencil)

1. How many eggs are there in 3 dozen? In $\frac{3}{4}$ dozen?

2. How many sheets of paper are there in $\frac{1}{2}$ quire?

3. How much each are oranges that are 60 cents a dozen?

4. A dealer buys knives at $6 a dozen and sells them at $8 a dozen. How much does he make on a gross?

The General Store

1. Mr. Jones, the storekeeper, bought 12 gouges for wood-carving at $6 a dozen. He sold them to the manual training teacher at 60¢ each. What was his profit?

2. Mr. Jones bought paper at $2.75 a ream and sold it for 18¢ a quire. How much did he make on each ream?

3. A box held 36 Scout knives, worth $1.75 apiece. Mr. Jones sold a dozen to a scout master for his troop. How much did they cost? How much would the whole box have cost?

4. At $40.80 a gross, how much are baseballs a dozen?

5. How much does Mr. Jones make on a gross of these baseballs, if he sells them at 35¢ apiece?

6. Door locks sell for $15 a dozen or $160 a gross. How much per gross did Mr. Jones save by buying in gross lots instead of by the dozen?

* *Note to the teacher:* Paper is now frequently sold in reams of 500 sheets.

The Neighborhood Grocery

1. At 12¢ a bag, how many bags of salt will $2.04 buy?

2. John bought a pound of bacon for 38¢. He gave Mr. Field, the grocer, a half-dollar. How much change did he receive?

3. Margaret bought a loaf of bread for 10¢ and two pounds of sugar for 14¢. How much was her change from 50¢?

4. George bought a dozen lemons for 45¢ and a pound of raisins for 18¢. He gave Mr. Field 75¢. How much did he get back?

5. Helen bought a pound of coffee at 45¢, a bottle of bluing at 14¢, and a bottle of vanilla at 25¢. To how much more or less than $1 did her purchases amount?

6. Robert bought 2 boxes of cereal at 13¢ a box, a can of soup at 11¢, a bottle of olives at 28¢, and 3 pounds of corn meal at 9¢ a pound. What was the amount of his purchases? How much change did he receive from $1?

7. A farmer sold Mr. Field 8 dozen eggs at 35¢ a dozen and bought 5 pounds of coffee at 45¢ a pound. How much did Mr. Field then owe the farmer?

CHAPTER REVIEWS

PROCESS REVIEW

1. Where is the decimal point placed in the result in addition and subtraction of dollars and cents? in multiplication by an integer? in division by an integer?

2. When you know the price of an article and the amount given in payment, how can you find the amount of change that is received?

3. Give the table of liquid measure. For what is liquid measure used?

4. Give the table of dry measure. For what is dry measure used?

5. Give the table of time. What is a leap year? How many days are there in each month?

6. How many units make a dozen? How many dozen make a gross? How many sheets of paper make a quire? What is a ream? How much is a score?

7. In general, when changing from a larger denomination to a smaller, what do you do? Why? When changing from a smaller denomination to a larger? Why?

DRILL EXAMPLES

Add.

1. \$31.75, \$20.82, \$167.90, \$350.37, \$116.18, \$7.92
2. \$460.15, \$8.65, \$42.19, \$761.20, \$15.93, \$627.05
3. \$6.58, \$198.26, \$532.87, \$900.02, \$42.35, \$785.28

4.	5.	6.
\$4,653.70	\$6,039.48	\$5,627.50
− 571.52	− 826.52	− 1,795.37

7. $\$84.79 \times 56$ **8.** $524 \times \$21.65$ **9.** $\$40.06 \times 802$

10. $73 \times \$127.48$ **11.** $\$26.08 \times 105$ **12.** $\$15.90 \times 230$

13. $\$450.40 \div 16$ **14.** $\$837.76 \div 32$ **15.** $\$1{,}078.56 \div 126$

16. $\$865.35 \div 27$ **17.** $\$3{,}290.30 \div 65$ **18.** $\$1{,}846.20 \div 204$

19. The first amount is the purchase price and the second is the money given. Find the change due.

37¢, \$1.00	\$2.86, \$5.00	\$6.79, \$10.00
57¢, 75¢	\$1.39, \$2.00	\$3.19, \$5.00

20. Change 2 gal. 3 qt. to quarts.

21. Change 9 bu. 2 pk. to pecks.

22. Change 15 da. 8 hr. to hours.

23. Change 17 min. 45 sec. to seconds.

24. Change 300 hr. to days and hours.

25. Change 330 qt. to pecks and quarts.

26. Change 250 da. to weeks and days.

27. Change 227 qt. to gallons and quarts.

28. Change 197 pecks to bushels and pecks.

GENERAL PROBLEMS

1. To build a garage a man bought 350 concrete blocks at 18 cents apiece. How much did they cost?

2. A farmer bought a horse for \$250 and two cows for \$130 each. What was the total cost?

3. Seven yards of cloth cost \$8.75. What is the price per yard?

4. Find the cost of 28 yards of oilcloth at \$2.25 a yard and 30 yards of carpet at \$2.90 a yard.

5. Mr. Bailey bought a rake for \$1.35, an oil can for

27¢, and 5 pounds of grass seed at 45¢ a pound. He gave the clerk a five-dollar bill. How much change did he receive?

6. A hardware dealer bought 8 doz. pairs of skates for $225.60. What was the price per pair?

7. A contractor bought 160 barrels of cement at $3.45 a barrel. What was the amount of his bill?

8. The wages of 26 carpenters for one week were $1,092. If all received the same wages, how much did each earn?

9. A farmer received $5,100 for a farm, at the rate of $75 an acre. How many acres did he sell?

GENERAL TESTS

I

1. Subtract. $124.63 − 96.28

2. $36 \times \$15.37$

3. $\$845.25 \div 35$

4. $\frac{2}{3} + \frac{1}{4} + \frac{5}{6}$

5. Find the cost of 7 bu. 3 pk. potatoes at 30¢ a peck.

6. Change 67 qt. to gallons and quarts.

II

1. Add $15\frac{1}{4}$ and $4\frac{5}{6}$.

2. Subtract $3\frac{5}{9}$ from $9\frac{1}{3}$.

3. $150 \times \$2.40$

4. 3 hr. 20 min. = ? min.

5. What is the cost of 8 tons of coal at $13.75 a ton?

6. In 56 days Tom's father earned $224. What were his wages by the day?

IMPROVEMENT TESTS

These exercises are given for you to test yourself on the work of the first half-year. The rating of each question is indicated. Try to secure 100 points in each group, and a total of 400 points for the exercise.

I. Addition

1. (6)
23
15
36
57
24
33
48
16

2. (10)
536
253
475
368
403
646
357
524

3. (8) $\frac{3}{5}$ / $\frac{4}{5}$

4. (8) $\frac{1}{2}$ / $\frac{1}{4}$

5. (8) $\frac{3}{4}$ / $\frac{1}{8}$

6. (9) $\frac{2}{3}$ / $\frac{2}{15}$

7. (7) $5\frac{1}{2}$ / 3

8. (10) $4\frac{1}{3}$ / $2\frac{1}{2}$

9. (10) $3\frac{2}{3}$ / $6\frac{5}{6}$

10. (10) $3\frac{1}{6}$ / $2\frac{5}{9}$

11. \$6.75+\$2.93+\$18+50¢+\$3.68 (14)

II. Subtraction

1. (10) 728 − 463

2. (10) 6,352 − 2,413

3. (15) \$40.34 − 11.86

4. (15) \$50.00 − 18.35

5. (5) $\frac{5}{8} - \frac{1}{8}$

6. (5) $\frac{5}{6} - \frac{1}{2}$

7. (5) $15\frac{3}{4} - 5$

8. (10) $18 - 4\frac{1}{2}$

9. (10) $12\frac{2}{3} - 4\frac{1}{2}$

10. (15) $20\frac{1}{6} - 14\frac{3}{4}$

III. Multiplication

1. (10) 63×124

2. (15) 406×675

3. (15) \$5.36×82

4. (20) \$88.70×160

5. (20) 205×709

6. (20) 342×564

IV. Division

1. (10) $5\overline{)\$82.50}$

2. (15) $8\overline{)38{,}096}$

3. (15) $74\overline{)47{,}582}$

4. (20) $68\overline{)54{,}672}$

5. (20) $57\overline{)20{,}520}$

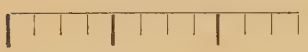
6. (20) $436\overline{)32{,}700}$

CHAPTER IV

COMMON FRACTIONS (*Continued*)

We have already studied fractions in Chapter II and learned how to use them in addition and subtraction. We shall now take up the different uses of fractions in multiplication and division.

Reduction of Mixed Numbers to Improper Fractions



How many fourths of a unit are there in $2\frac{3}{4}$ units? $2\frac{3}{4} = \frac{?}{4}$

Reduce $5\frac{2}{3}$ to an improper fraction.

As $1 = \frac{3}{3}$, $5 = 5 \times \frac{3}{3} = \frac{15}{3}$

Then, $5\frac{2}{3} = \frac{15}{3} + \frac{2}{3} = \frac{17}{3}$

or, $5\frac{2}{3} = \frac{15+2}{3} = \frac{17}{3}$

To reduce a mixed number to an improper fraction, multiply the integer by the denominator of the fraction, and add the numerator to this product; place the result over the denominator.

While there is very little need of changing a mixed number by itself to an improper fraction, such a change is of much value when mixed numbers are used in multiplication and division.

Change these mixed numbers to improper fractions.

1. $4\frac{5}{9}$	**4.** $11\frac{2}{9}$	**7.** $14\frac{5}{8}$	**10.** $16\frac{2}{3}$
2. $3\frac{3}{4}$	**5.** $3\frac{7}{12}$	**8.** $15\frac{9}{10}$	**11.** $20\frac{1}{2}$
3. $7\frac{5}{6}$	**6.** $12\frac{3}{4}$	**9.** $13\frac{4}{5}$	**12.** $7\frac{5}{6}$

MULTIPLICATION OF FRACTIONS

I. Multiplication by an Integer

A. Multiplying Fractions by Integers

How much is 3 times 2 feet? 3 times 2 fifths? 4 times 1 dollar? 4 times 1 ninth?

Into how many equal parts is this diagram divided? What is each part called? From the diagram we see that

$3 \times \frac{2}{9} = \frac{6}{9}$; $\frac{6}{9} = \frac{3 \times 2}{9}$

or, $3 \times \frac{2}{9} = \frac{2}{3}$; $\frac{2}{3} = \frac{2}{9 \div 3}$

To multiply a fraction by an integer, either multiply the numerator by the integer or divide the denominator by the integer.

(Without pencil)

1. $2 \times \frac{1}{5}$
2. $4 \times \frac{2}{9}$
3. $3 \times \frac{3}{8}$
4. $11 \times \frac{1}{6}$
5. $8 \times \frac{3}{4}$
6. $10 \times \frac{1}{15}$
7. $4 \times \frac{1}{8}$
8. $3 \times \frac{1}{12}$
9. $5 \times \frac{3}{10}$
10. $3 \times \frac{7}{18}$
11. $5 \times \frac{3}{20}$
12. $3 \times \frac{14}{15}$

Cancellation

$28 \times \frac{5}{8}$

$28 \times \frac{5}{8} = \frac{\overset{7}{\cancel{28} \times 5}}{\underset{2}{\cancel{8}}} = \frac{35}{2} = 17\frac{1}{2}$

Before multiplying, we divide both 28 and 8 by the common divisor 4. This process is called *cancellation.*

1. $16 \times \frac{11}{12}$
2. $18 \times \frac{7}{24}$
3. $24 \times \frac{5}{16}$
4. $21 \times \frac{9}{28}$
5. $40 \times \frac{7}{24}$
6. $45 \times \frac{5}{18}$

From these diagrams we see that $\frac{2}{3}$ of 2 is $\frac{4}{3}$; that is, $\frac{2}{3}$ of $2 = \frac{2}{3} \times 2$.

To find a fractional part of a number, multiply the number by the fraction. Use cancellation when possible.

(Without pencil)

1. $\frac{2}{3}$ of 4 **2.** $\frac{3}{4}$ of 12 **3.** $\frac{3}{8}$ of 4 **4.** $\frac{3}{5}$ of 20 **5.** $\frac{4}{5}$ of 3

(With pencil)

Find $\frac{8}{15}$ of 27.

$$\frac{8 \times \overset{9}{\cancel{27}}}{\underset{5}{\cancel{15}}} = \frac{72}{5} = 14\frac{2}{5}$$

1. $\frac{5}{8}$ of 36
2. $\frac{9}{10}$ of 25
3. $\frac{5}{18}$ of 48
4. $\frac{7}{12}$ of 66
5. $\frac{9}{16}$ of 40
6. $\frac{5}{12}$ of 72
7. $\frac{4}{5}$ of 100
8. $\frac{3}{8}$ of 120
9. $\frac{11}{18}$ of 90
10. $\frac{7}{10}$ of 110

PROBLEMS

1. In an audience of 128 visitors present on Parents' Day, $\frac{5}{8}$ were women. How many women were present?

2. Rob and his father made a trip of 172 miles in two days. They went $\frac{3}{4}$ of the distance the first day. How far did they have to go the second day?

3. Jackson School has 450 pupils. Two fifths of these come from out of town. How many out-of-town pupils attend this school?

4. There are 250 children attending the Columbus School. Three fifths of these are in the first four grades. How many pupils are in these grades?

5. A farmer sold $\frac{5}{12}$ of his farm of 150 acres. How many acres did he have left?

B. Multiplier or Multiplicand a Mixed Number

A.			*B.*	
17			$3\frac{2}{5}$	
$5\frac{1}{2}$			4	
$8\frac{1}{2}$	$\frac{1}{2} \times 17 = 8\frac{1}{2}$		$1\frac{3}{5}$	$4 \times \frac{2}{5} = \frac{8}{5} = 1\frac{3}{5}$
85	$5 \times 17 = 85$		12	$4 \times 3 = 12$
$93\frac{1}{2}$			$13\frac{3}{5}$	

When a mixed number and an integer are multiplied together, the fraction and the integer of the mixed number are used separately in multiplication and the results are added.

Another way is to change the mixed number to an improper fraction and then multiply the resulting fraction by the integer. Thus: $3 \times 2\frac{1}{4} = 3 \times \frac{9}{4} = \frac{27}{4} = 6\frac{3}{4}$.

1. $4 \times 2\frac{1}{5}$	**4.** $2 \times 8\frac{1}{6}$	**7.** $6\frac{1}{4} \times 24$	**10.** $11 \times 9\frac{2}{5}$
2. $7 \times 3\frac{1}{8}$	**5.** $9\frac{1}{2} \times 8$	**8.** $8 \times 7\frac{2}{3}$	**11.** $8\frac{1}{4} \times 27$
3. $3 \times 9\frac{1}{4}$	**6.** $4\frac{1}{3} \times 15$	**9.** $6 \times 15\frac{3}{8}$	**12.** $18\frac{3}{5} \times 9$

PROBLEMS

1. How much will 8 cakes of soap cost at $12\frac{1}{2}$¢ a cake?

2. It takes $5\frac{1}{4}$ yards of rope to make a swing. How much rope will be required to make 25 swings for the playground?

3. Sarah lives $1\frac{1}{4}$ miles from school. How far does she have to walk going to and from school morning and afternoon?

4. It took 7 strips of linoleum, each $5\frac{2}{9}$ yards long, to cover a floor. How many yards were required?

5. A workman earns $87\frac{1}{2}$ cents an hour. How much are his wages for a week of 44 hours?

II. Multiplication by a Fraction

A. Multiplying Fractions by Fractions

$\frac{1}{2}\times\frac{3}{4}=$—?

If we divide the figure at the left into fourths by vertical lines and then divide these fourths into halves by horizontal lines, the whole figure will be divided into eighths.

We see that $\frac{3}{4}$ of the whole figure equals $\frac{6}{8}$, and $\frac{1}{2}$ of $\frac{6}{8}=\frac{3}{8}$.

$$\frac{1}{2}\times\frac{3}{4}=\frac{1\times3}{2\times4}=\frac{3}{8}.$$

To multiply one fraction by another fraction, multiply the numerators together for the new numerator and multiply the denominators together for the new denominator. Cancel when possible.

(Without pencil)

1. $\frac{1}{2}\times\frac{1}{3}$
2. $\frac{1}{3}\times\frac{2}{5}$
3. $\frac{1}{2}\times\frac{5}{8}$
4. $\frac{1}{3}\times\frac{1}{4}$
5. $\frac{3}{4}$ of $\frac{1}{5}$
6. $\frac{2}{3}$ of $\frac{2}{5}$
7. $\frac{5}{6}$ of $\frac{1}{3}$
8. $\frac{3}{4}$ of $\frac{3}{4}$

$$\frac{5}{8}\times\frac{1}{2}\frac{2}{5}=\frac{\overset{1}{\cancel{5}}\times\overset{3}{\cancel{12}}}{\underset{2}{\cancel{8}}\times\underset{5}{\cancel{25}}}=\frac{3}{10}$$

(With pencil)

1. $\frac{2}{3}\times\frac{3}{8}$
2. $\frac{1}{2}\times\frac{4}{7}$
3. $\frac{2}{3}\times\frac{5}{6}$
4. $\frac{7}{8}\times\frac{4}{5}$
5. $\frac{5}{6}\times\frac{8}{15}$
6. $\frac{3}{4}\times\frac{8}{9}$
7. $\frac{3}{10}$ of $\frac{8}{9}$
8. $\frac{15}{16}$ of $\frac{4}{9}$
9. $\frac{5}{12}$ of $\frac{3}{10}$
10. $\frac{5}{12}$ of $\frac{9}{20}$
11. $\frac{9}{10}$ of $\frac{8}{15}$
12. $\frac{8}{15}$ of $\frac{9}{16}$

PROBLEMS

1. John painted $\frac{2}{5}$ of a floor one day and $\frac{1}{3}$ as much the next day. What part of the floor did he paint the second day?

2. A girl had $\frac{7}{8}$ yard of ribbon and she put $\frac{2}{3}$ of it on a hat. What part of a yard did she use?

3. At a boys' club meeting $\frac{8}{9}$ of the members attended and $\frac{3}{4}$ of those present voted to have a picnic. What part of the entire membership voted in favor of the picnic?

4. It took a train $\frac{9}{10}$ of a minute to go a mile. How long did it take to go $\frac{5}{6}$ of a mile?

5. A street is $\frac{5}{8}$ of a mile long and $\frac{7}{10}$ of it is paved. What part of a mile is paved?

6. It took John $\frac{4}{5}$ of an hour to do his problems, but it took James only $\frac{7}{8}$ as much time. What part of an hour did it take James?

B. Multiplying Mixed Numbers by Fractions

Multiply $4\frac{1}{5}$ by $\frac{2}{3}$

$$\frac{2}{3} \times 4\frac{1}{5} = \frac{2}{\cancel{3}} \times \frac{\overset{7}{\cancel{21}}}{5} = \frac{14}{5} = 2\frac{4}{5}$$

To multiply a mixed number by a fraction, change the mixed number to an improper fraction and proceed as in the multiplication of a fraction by a fraction.

1. $\frac{1}{2}$ of $1\frac{3}{7}$
2. $\frac{2}{5}$ of $3\frac{1}{8}$
3. $\frac{3}{8}$ of $3\frac{1}{5}$
4. $\frac{5}{9}$ of $3\frac{3}{10}$
5. $\frac{3}{4}$ of $5\frac{1}{6}$
6. $\frac{5}{8}$ of $10\frac{2}{3}$
7. $\frac{5}{6}$ of $13\frac{1}{2}$
8. $\frac{2}{3}$ of $8\frac{1}{4}$

III. Multiplication of Mixed Numbers by Mixed Numbers

Multiply $3\frac{1}{3}$ by $4\frac{1}{8}$.

$$4\frac{1}{8} \times 3\frac{1}{3} = \frac{\overset{1}{\cancel{3}}\,\overset{1}{\cancel{3}}}{\underset{4}{\cancel{8}}} \times \frac{\overset{5}{\cancel{10}}}{\cancel{3}} = \frac{5}{4}\frac{5}{} = 13\frac{3}{4}$$

To multiply a mixed number by a mixed number, change both mixed numbers to improper fractions and proceed as in the multiplication of a fraction by a fraction.

1. $7\frac{1}{2} \times 3\frac{1}{5}$	**4.** $6\frac{3}{4} \times 8\frac{2}{3}$	**7.** $7\frac{1}{5} \times 10\frac{5}{6}$	**10.** $7\frac{3}{4} \times 10\frac{1}{2}$
2. $4\frac{2}{3} \times 2\frac{5}{8}$	**5.** $2\frac{3}{4} \times 4\frac{1}{3}$	**8.** $8\frac{1}{2} \times 9\frac{1}{4}$	**11.** $8\frac{1}{3} \times 12\frac{5}{6}$
3. $2\frac{2}{5} \times 5\frac{5}{8}$	**6.** $8\frac{3}{4} \times 7\frac{3}{5}$	**9.** $9\frac{1}{2} \times 8\frac{2}{3}$	**12.** $6\frac{3}{4} \times 11\frac{1}{3}$

See pages 310 and 311 for additional drill examples.

PROBLEMS

1. To make a swing Robert uses $\frac{2}{3}$ of a piece of rope $36\frac{1}{2}$ feet long. How much does he use?

2. At $2\frac{1}{2}¢$ a foot how much will 40 feet of radio aërial wire cost?

3. A tank holding $41\frac{1}{2}$ gallons is $\frac{2}{3}$ full of oil. How much oil is in the tank?

4. On a certain map $\frac{3}{4}$ inch represents 1 mile. How far apart on the map would two towns be which are actually 12 miles from each other? two towns which are 15 miles apart?

5. A man worked 16 hours on a job at $87\frac{1}{2}$ cents an hour and used \$7.35 worth of material. What was the total cost of the job?

Using and Changing Recipes

Recipes for bread, pie, cake, etc., tell the amount of each ingredient needed to make a certain quantity. To make twice as much, we use twice as much of everything as the recipe calls for. How do we make half the amount? One third?

1. Mrs. Thomas uses this recipe for gingerbread.

1 cup molasses
$\frac{1}{2}$ cup boiling water
$2\frac{1}{4}$ cups flour
1 teaspoon soda
$1\frac{1}{2}$ teaspoons ginger
$\frac{1}{2}$ teaspoon salt
4 tablespoons melted butter

One day she decided to make twice the amount of the recipe. How much did she use of the different materials?

2. One day Mrs. White made cookies from this recipe.

$\frac{1}{3}$ cup butter
$\frac{2}{3}$ cup sugar
1 egg
2 tablespoons milk
$1\frac{3}{4}$ cups flour
2 teaspoons baking powder
$\frac{1}{3}$ cup raisins
$\frac{1}{2}$ teaspoon cinnamon
$\frac{1}{4}$ teaspoon cloves
$\frac{1}{4}$ teaspoon nutmeg

She made three times the amount of the recipe. How much did she use of the different materials?

3. This is a good recipe for molasses candy.

1 cup molasses
3 cups sugar
1 cup boiling water
3 tablespoons vinegar
$\frac{1}{2}$ teaspoon cream of tartar
$\frac{1}{2}$ cup melted butter
$\frac{1}{4}$ teaspoon soda

Make a new recipe for half the amount.

DIVISION OF FRACTIONS

I. Division by a Fraction

A. Dividing Integers by Fractions

Divide 1 by $\frac{1}{2}$.

As $1=\frac{2}{2}$, the example becomes $\frac{2}{2}\div\frac{1}{2}$.

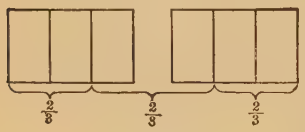
Now, 2 apples $\div$ 1 apple $=2$

In like manner, 2 halves $\div$ 1 half $=2$

or, $\frac{2}{2}\div\frac{1}{2}=2$

That is, $\frac{2}{2}\div\frac{1}{2}=\frac{2}{2}\times\frac{2}{1}=\frac{2}{1}=2$; or, $1\div\frac{1}{2}=1\times\frac{2}{1}=2$

Divide 2 by $\frac{2}{3}$.



$2=\frac{6}{3}$. The example then becomes $\frac{6}{3}\div\frac{2}{3}$

Just as 6 inches $\div$ 2 inches $=3$

so, $\frac{6}{3}\div\frac{2}{3}=3$

or, $\frac{6}{3}\div\frac{2}{3}=\frac{\overset{3}{\cancel{6}}}{\cancel{3}}\times\frac{\cancel{3}}{\cancel{2}}=3$

That is, $2\div\frac{2}{3}=\cancel{2}\times\frac{3}{\cancel{2}}=3$

Changing $\frac{2}{3}$ to $\frac{3}{2}$ is called *inverting* $\frac{2}{3}$. How then do you invert any fraction?

To divide an integer by a fraction, invert the divisor and multiply.

1. $2\div\frac{1}{4}$	**5.** $10\div\frac{5}{6}$	**9.** $5\div\frac{2}{3}$	**13.** $10\div\frac{3}{4}$
2. $6\div\frac{3}{5}$	**6.** $3\div\frac{4}{5}$	**10.** $6\div\frac{5}{6}$	**14.** $12\div\frac{8}{9}$
3. $8\div\frac{4}{5}$	**7.** $4\div\frac{5}{7}$	**11.** $10\div\frac{4}{5}$	**15.** $15\div\frac{7}{8}$
4. $9\div\frac{3}{4}$	**8.** $2\div\frac{2}{5}$	**12.** $11\div\frac{1}{6}$	**16.** $20\div\frac{6}{7}$

PROBLEMS

1. From a box containing 2 pounds of candy, small boxes each containing $\frac{1}{4}$ pound are to be filled. How many small boxes will be needed?

2. How many books can be wrapped in 5 sheets of paper if each book requires $\frac{1}{3}$ sheet?

3. Mrs. King, the sewing teacher, uses $\frac{3}{4}$ yard of cloth for an apron. How many aprons can be made from a piece of cloth containing 12 yards?

4. A pole 3 yards long is how many times as long as a stick $\frac{7}{8}$ yard long?

5. Some small books are each $\frac{5}{8}$ inch thick. How many of them are there in a pile 10 inches high?

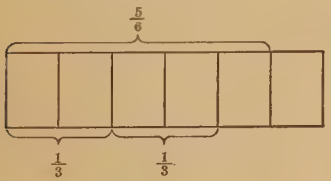
6. How many times can a pitcher holding $\frac{4}{5}$ gallon be filled from a tank holding 6 gallons?

7. For trimming Mrs. Jones is using pieces of braid $\frac{5}{6}$ yd. long. How many pieces can she get from 10 yd. of braid?

8. How many dusters $\frac{2}{3}$ yd. long can be cut from a piece of cloth 7 yd. long?

B. Dividing Fractions by Fractions

Divide $\frac{5}{6}$ by $\frac{1}{3}$.



Since $1 \div \frac{1}{3} = 1 \times \frac{3}{1} = 3$
$\frac{5}{6} \div \frac{1}{3}$ will be $\frac{5}{6}$ as much as $1 \div \frac{1}{3}$
Then, $\frac{5}{6} \div \frac{1}{3} = \frac{5}{\cancel{6}_{2}} \times \frac{\cancel{3}^{1}}{1} = \frac{5}{2} = 2\frac{1}{2}$

This is illustrated by the diagram, which shows that $\frac{1}{3}$ is contained in $\frac{5}{6}$, 2 times and $\frac{1}{2}$ another time. That is, $\frac{5}{6} \div \frac{1}{3} = 2\frac{1}{2}$.

To divide one fraction by another, invert the divisor and multiply.

1. $\frac{3}{4} \div \frac{1}{4}$
2. $\frac{5}{6} \div \frac{2}{3}$
3. $\frac{7}{8} \div \frac{3}{4}$
4. $\frac{2}{3} \div \frac{2}{9}$
5. $\frac{2}{3} \div \frac{4}{5}$
6. $\frac{3}{4} \div \frac{5}{8}$
7. $\frac{5}{8} \div \frac{1}{4}$
8. $\frac{3}{4} \div \frac{7}{12}$
9. $\frac{1}{2} \div \frac{5}{6}$
10. $\frac{3}{8} \div \frac{9}{16}$
11. $1\frac{1}{2} \div \frac{5}{6}$
12. $\frac{8}{15} \div \frac{2}{5}$

C. Dividing Mixed Numbers by Fractions

$2\frac{1}{2} \div \frac{3}{4}$

$2\frac{1}{2} \div \frac{3}{4} = \frac{5}{\cancel{2}} \times \frac{\overset{2}{\cancel{4}}}{3} = \frac{10}{3} = 3\frac{1}{3}$

To divide a mixed number by a fraction, change the mixed number to an improper fraction and proceed as in division of a fraction by a fraction.

1. $3\frac{1}{3} \div \frac{5}{6}$
2. $3\frac{3}{4} \div \frac{3}{8}$
3. $2\frac{2}{5} \div \frac{2}{3}$
4. $2\frac{2}{3} \div \frac{2}{5}$
5. $3\frac{1}{3} \div \frac{8}{9}$
6. $5\frac{1}{4} \div \frac{7}{10}$
7. $5\frac{3}{4} \div \frac{5}{6}$
8. $4\frac{1}{4} \div \frac{3}{5}$

PROBLEMS

1. How many times is $\frac{1}{2}$ inch contained in $\frac{3}{4}$ inch?

2. On a certain map, $\frac{3}{4}$ inch represents a mile. What distance is represented by $4\frac{1}{2}$ inches?

3. Jelly is to be put into jars holding $\frac{2}{3}$ pint. How many jars will be needed to hold $5\frac{1}{3}$ pints?

4. From a piece of felt $4\frac{1}{2}$ yards long, how many school banners $\frac{3}{4}$ yard long can be made?

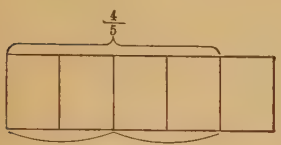
5. On $3\frac{1}{2}$ acres of land, how many $\frac{7}{8}$-acre plots can be laid out?

6. If it takes about $\frac{5}{6}$ of an hour to play a set of tennis, how many sets can be played on a school court in $7\frac{1}{2}$ hours?

II. Division by an Integer

A. Dividing Fractions by Integers

Divide $\frac{4}{5}$ by 2.



Just as 4 apples $\div$ 2 = 2 apples,
so, 4 fifths $\div$ 2 = 2 fifths.
That is, $\frac{4}{5} \div 2 = \frac{2}{5}$;
or, $\frac{4}{5} \div 2 = \frac{4}{5} \div \frac{2}{1} = \frac{4}{5} \times \frac{1}{2} = \frac{2}{5}$

To divide a fraction by an integer, write the integer as a fraction with the denominator 1, and divide as with fractions.

1. $\frac{2}{3} \div 2$	4. $\frac{5}{6} \div 5$	7. $\frac{2}{3} \div 3$	10. $\frac{2}{3} \div 5$
2. $\frac{9}{10} \div 3$	5. $\frac{8}{15} \div 4$	8. $\frac{3}{5} \div 2$	11. $\frac{3}{5} \div 4$
3. $\frac{8}{9} \div 2$	6. $\frac{15}{16} \div 5$	9. $\frac{3}{4} \div 2$	12. $\frac{7}{8} \div 2$

PROBLEMS

1. Oscar divided $\frac{1}{2}$ yard of insulated wire into three equal parts to use on his wireless set. How long was each of the parts?

2. Mrs. Simpson gave Margery and Walter a quarter of a pie to divide equally between them. What part of the pie did each have?

3. The distance around a square park is $\frac{1}{2}$ mile. How long is the park on each side?

4. Carlton walked $\frac{5}{8}$ mile in 10 minutes. What part of a mile did he average each minute?

5. Six girls made club badges from $\frac{2}{3}$ yd. ribbon. What part of a yard of ribbon was used for each one of these badges?

6. Three quarters of a pound of lemon drops was put into six bags. What part of a pound was in each bag?

7. Three fifths of a dollar was divided equally among twelve boys. What part of a dollar was each boy's share?

8. Rachel did four problems in $\frac{2}{3}$ hour. About what part of an hour was needed for each problem?

9. Four fifths of a barrel of apples was put into 8 baskets of the same size. What part of a barrel was in each basket?

10. Two girls divided $\frac{3}{4}$ yd. of silk equally between them. How long was each piece?

11. It took a group of boy campers 10 days to make a new path $\frac{5}{8}$ mile long through the woods to their camp. What part of a mile did they average each day?

B. Dividing Mixed Numbers by Integers

Divide $3\frac{1}{2}$ by 2.

Change $3\frac{1}{2}$ to an improper fraction; then proceed as in the division of a fraction by an integer.

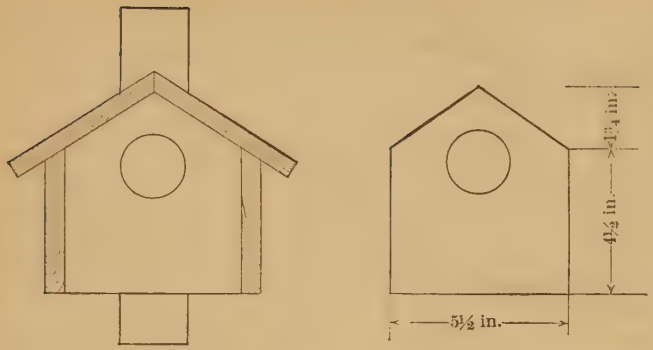
$$3\tfrac{1}{2} \div 2 = \tfrac{7}{2} \div \tfrac{2}{1} = \tfrac{7}{2} \times \tfrac{1}{2} = \tfrac{7}{4} = 1\tfrac{3}{4}$$

To divide a mixed number by an integer, change the mixed number to an improper fraction, and write the integer as a fraction with the denominator 1; then divide as with fractions.

1. $4\frac{1}{2} \div 3$	**4.** $5\frac{1}{2} \div 4$	**7.** $5\frac{1}{4} \div 4$	**10.** $9\frac{1}{2} \div 4$
2. $3\frac{1}{3} \div 2$	**5.** $4\frac{1}{2} \div 5$	**8.** $7\frac{1}{2} \div 5$	**11.** $8\frac{1}{4} \div 6$
3. $2\frac{2}{3} \div 6$	**6.** $4\frac{1}{4} \div 2$	**9.** $3\frac{1}{5} \div 4$	**12.** $9\frac{3}{8} \div 12$

See pages 311 and 312 for additional drill examples.

A Bird House



Here is the drawing of a bird house and also of its front end piece.

1. How long is it from the bottom to the top of the front end piece?

2. How long would a piece of wood have to be in order to cut 6 front end pieces from it?

3. Knowing the width of the front end piece, find the distance from the center of the entrance hole to one side of the piece.

4. On each side of the front end piece there is to be a side piece $\frac{1}{2}$ inch wide, as shown in the first drawing. What is the total width of the front of the bird house?

5. The board used in making the bird house is $\frac{1}{2}$ inch thick and the nails used are $1\frac{1}{4}$ inches long. How far will the nails extend beyond the half-inch pieces?

6. It took a boy $12\frac{1}{2}$ hours to build the bird house. At ten cents an hour, what was the cost of his labor?

III. Division by a Mixed Number

A. Dividing Integers by Mixed Numbers

Divide 6 by $2\frac{1}{4}$.

$$6 \div 2\tfrac{1}{4} = 6 \div \tfrac{9}{4} = \overset{2}{\cancel{6}} \times \tfrac{4}{\cancel{9}_{3}} = \tfrac{8}{3} = 2\tfrac{2}{3}$$

To divide an integer by a mixed number, change the mixed number to an improper fraction; then proceed as in the division of an integer by a fraction.

1. $4 \div 1\frac{2}{3}$	**4.** $6 \div 1\frac{1}{5}$	**7.** $20 \div 3\frac{3}{4}$	**10.** $6 \div 3\frac{2}{3}$
2. $3 \div 2\frac{1}{4}$	**5.** $7 \div 2\frac{1}{3}$	**8.** $12 \div 2\frac{2}{3}$	**11.** $4 \div 6\frac{2}{3}$
3. $3 \div 1\frac{5}{6}$	**6.** $15 \div 1\frac{1}{4}$	**9.** $8 \div 2\frac{4}{5}$	**12.** $14 \div 5\frac{1}{4}$

B. Dividing Mixed Numbers by Mixed Numbers

Divide $3\frac{2}{3}$ by $1\frac{1}{6}$.

$$3\tfrac{2}{3} \div 1\tfrac{1}{6} = \tfrac{11}{3} \div \tfrac{7}{6} = \tfrac{11}{\cancel{3}} \times \overset{2}{\tfrac{\cancel{6}}{7}} = \tfrac{22}{7} = 3\tfrac{1}{7}$$

To divide one mixed number by another, change both mixed numbers to improper fractions and proceed as in the division of fractions.

1. $2\frac{1}{2} \div 1\frac{2}{3}$	**4.** $2\frac{3}{4} \div 8\frac{1}{4}$	**7.** $9\frac{1}{6} \div 1\frac{1}{9}$	**10.** $11\frac{1}{4} \div 3\frac{1}{8}$
2. $4\frac{1}{2} \div 1\frac{1}{2}$	**5.** $9\frac{1}{3} \div 1\frac{1}{6}$	**8.** $6\frac{7}{8} \div 2\frac{1}{4}$	**11.** $4\frac{3}{5} \div 6\frac{9}{10}$
3. $7\frac{1}{2} \div 1\frac{1}{4}$	**6.** $1\frac{5}{8} \div 2\frac{1}{4}$	**9.** $3\frac{2}{3} \div 4\frac{2}{5}$	**12.** $12\frac{3}{5} \div 2\frac{7}{10}$

13. In five of these examples, multiply the quotient by the divisor. What is the result in each case? Does this prove your work?

PROBLEMS

1. At $1\frac{1}{2}$ cents each, how many papers can a newsboy buy for 21 cents?

2. The product of two numbers is 26. One of the numbers is $3\frac{1}{4}$. What is the other number?

3. How many strips of pipe $2\frac{1}{4}$ yards long are necessary to make a guard rail $13\frac{1}{2}$ yards long for the school walk?

4. At $4\frac{1}{3}$ cents a pound, how many pounds of sweet potatoes can be bought for 39 cents?

5. There are $5\frac{1}{2}$ yards in a rod. How many rods are there in a fence 33 yards long?

6. A team can carry $1\frac{1}{4}$ tons of coal. How many trips must it make to deliver an order of $7\frac{1}{2}$ tons of coal to Lucy's home?

7. An airplane flies at the rate of $1\frac{2}{5}$ miles per minute. How long will it take to cover the distance between two cities $11\frac{2}{3}$ miles apart?

8. Six boys divided $2\frac{5}{8}$ bushels of apples among them. What part of a bushel did each boy receive?

9. In the manual training class Henry is to cut a 12-foot board into pieces $1\frac{1}{4}$ feet long. How many such pieces can he get? What part of a piece will be left over?

10. A farmer divided a $12\frac{1}{2}$-acre piece of land into $1\frac{1}{4}$-acre plots to rent to gardeners. How many such plots were there?

11. Mr. Brown planted $4\frac{3}{8}$ quarts of corn at the rate of $1\frac{3}{4}$ quarts an hour. How long did it take him?

The Sewing Class

1. Six girls made sewing aprons. For each they used $1\frac{1}{8}$ yd. of gingham at 28¢ a yard. What was the cost of all the aprons?

2. In Miss Green's sewing class the girls hemmed table napkins. Miss Green bought linen $1\frac{1}{2}$ yd. wide, which she cut into two equal strips. How wide was each strip?

3. Next she cut each strip into pieces 27 inches square. In each hem $\frac{3}{8}$ inch of linen was used. Tell the size of a finished napkin.

4. Miss Green also bought linen $1\frac{1}{2}$ yd. wide for tea napkins. This she cut into three equal strips. How many inches wide was each strip?

5. From these strips napkins were cut, each as long as the strips were wide. Allowing $\frac{1}{2}$ inch for each hem, tell the size of the tea napkins.

6. Four girls wanted to make handkerchiefs for Christmas gifts. Each made the same number and together they made two dozen. What part of a dozen did each make?

7. Each girl was given a strip of linen 36 inches long

and 12 inches wide for her handkerchiefs. She cut it into 3 equal squares. Allowing $\frac{1}{4}$ inch for each hem, find the size of each handkerchief.

8. How much lace did it take to edge one of these handkerchiefs, if $\frac{5}{8}$ inch was allowed for fullness at each corner?

9. Lucy had a table scarf with a pattern stamped on it. She bought two pieces of braid, each $7\frac{1}{2}$ yd. long. Find the cost of the braid at $2\frac{1}{2}$¢ a yard.

10. She used all the first piece and $5\frac{3}{8}$ yd. of the second piece. How much did she use? How much was left?

Household Expenses

1. Helen Brown's father pays $35 a month rent. What is the rent for a year?

2. Mrs. Brown pays $2.50 each week for the washing and ironing. To how much does this amount in a year (52 weeks)?

3. Last year Mr. Brown paid $31.20 for gas. What was the average cost of gas per month?

4. The telephone costs $2.50 a month. There were extra charges of $3.15 for out-of-town calls during the year. What was the total telephone cost for the year?

5. Mr. Brown bought nine tons of coal at $13.75 a ton and paid 40¢ a ton for having it carried in. What was his bill for coal?

6. Their daily paper costs 75¢ a month and the Sunday paper 6¢ a week. How much is the newspaper bill for one year?

7. Mr. Brown takes a magazine that costs \$2.50 a year, Mrs. Brown takes one that costs \$3, and Helen one that costs \$2.75. What is the magazine bill for the year?

8. Helen takes a music lesson each week during 40 weeks of the year. The lesson costs \$1 and her car fare each week is 14¢. How much is the total cost of the lessons for one year, including car fare?

9. Mrs. Brown hired Joe Cox to mow the lawn at 20¢ an hour. It took him $4\frac{1}{2}$ hours. How much did he earn?

10. Mrs. Brown engaged a man to beat rugs at 75¢ an hour and a woman to clean at 50¢ an hour. The man worked $5\frac{2}{3}$ hours and the woman worked $11\frac{1}{2}$ hours. How much did Mrs. Brown pay for this house-cleaning work?

11. Helen bought two quarts of milk at 14¢ a quart, two loaves of bread at 12¢ a loaf, and $1\frac{1}{2}$ pounds of butter at 40¢ a pound. How much was her bill?

12. Helen took her shoes and her father's shoes to the shoe shop to be repaired. It cost 55¢ for Helen's shoes and twice as much for her father's. She paid the shoemaker with a \$2 bill. How much change did she receive?

13. Mr. Brown bought a phonograph for \$25, five records at 75¢ each, three records at \$1 each, and two records at \$1.25 each. What was the cost of the phonograph and records?

14. One morning Mrs. Brown had \$10 in the house. During the day she paid out \$.40 for bananas, \$1.75 for other groceries, \$.75 for tickets to an entertainment, \$.35 express charges, and \$1.40 for some kitchenware. How much of the \$10 was left at the end of the day?

CHAPTER REVIEWS

PROCESS REVIEW

1. How do you change a mixed number to an improper fraction?

2. How do you multiply a fraction by an integer?

3. How do you find a fractional part of a number?

4. By what two methods can a mixed number be multiplied by an integer?

5. How do you multiply one fraction by another? What process often simplifies the work?

6. How do you multiply a mixed number by a fraction? by a mixed number?

7. What is the important rule to remember in division of fractions?

8. How do you divide fractions or mixed numbers by an integer?

9. How do you divide a mixed number by a fraction? by a mixed number?

10. In what two ways may the value of a fraction be increased? In what two ways may it be decreased?

DRILL EXAMPLES

1. Reduce the following mixed numbers to improper fractions.

$3\frac{2}{5}$ $5\frac{6}{7}$ $8\frac{3}{4}$ $15\frac{2}{3}$ $21\frac{5}{8}$

2. Find

$\frac{5}{8}$ of 32. $\frac{7}{12}$ of 15. $\frac{5}{16}$ of 24. $\frac{1}{18}$ of 42.

3.	$8 \times 6\frac{3}{4}$	$6 \times 10\frac{4}{5}$	$8 \times 11\frac{5}{8}$	$9\frac{7}{10} \times 12$
4.	$\frac{2}{3} \times \frac{4}{5}$	$\frac{5}{6} \times \frac{3}{20}$	$\frac{10}{15} \times \frac{5}{8}$	$\frac{4}{5} \times \frac{5}{12}$
5.	$\frac{3}{4} \times 3\frac{1}{5}$	$6\frac{2}{3} \times 4\frac{1}{5}$	$2\frac{2}{5} \times 3\frac{3}{4}$	$2\frac{7}{9} \times 2\frac{7}{10}$

Find these quotients.

6.	$6 \div \frac{4}{9}$	$\frac{7}{8} \div \frac{7}{12}$	$7\frac{1}{2} \div \frac{3}{4}$	$5\frac{1}{3} \div \frac{2}{3}$
7.	$15 \div \frac{5}{6}$	$\frac{4}{5} \div \frac{7}{10}$	$9\frac{2}{3} \div \frac{5}{6}$	$4\frac{1}{6} \div \frac{5}{9}$
8.	$\frac{2}{3} \div 4$	$\frac{4}{5} \div 8$	$6\frac{3}{4} \div 6$	$3\frac{3}{8} \div 18$
9.	$8 \div 2\frac{2}{5}$	$6 \div 6\frac{2}{3}$	$1\frac{1}{6} \div 1\frac{5}{9}$	$4\frac{1}{5} \div 3\frac{3}{5}$

GENERAL PROBLEMS

1. Charles weeded $\frac{1}{3}$ of his garden in the morning and $\frac{2}{5}$ of it in the afternoon. What part of the garden did he weed that day? What part remained to be weeded?

2. A workman sawed a board into two pieces, $4\frac{5}{6}$ feet long and $3\frac{1}{2}$ feet long. How long was the board at first?

3. Alfred and John started on a $7\frac{1}{2}$-mile hike. They sat down to rest after walking $4\frac{3}{4}$ miles. How far had they still to go?

4. The sum of two fractions is $\frac{5}{6}$. One of the fractions is $\frac{2}{9}$. What is the other fraction?

5. Peter is $9\frac{1}{2}$ years old and Oscar is $7\frac{1}{6}$ years old. What is the difference in their ages?

6. Rose had a piece of ribbon $4\frac{3}{4}$ yards long. After she used $\frac{1}{2}$ yard, $\frac{3}{4}$ yard, and $2\frac{1}{8}$ yards, how much ribbon was left?

7. At $8\frac{1}{2}$ cents a pound, what is the cost of 8 pounds of cornmeal?

8. A store had its winter supply of 30 tons of coal put into 4 bins. Into the first was put $6\frac{3}{5}$ tons, into the second $8\frac{1}{4}$ tons, and into the third $7\frac{1}{2}$ tons. How much was put into the fourth bin?

9. Albert rides for $4\frac{1}{2}$ hours at an average rate of $6\frac{2}{3}$ miles an hour. What distance does he go?

10. A strip of paper $8\frac{3}{4}$ inches wide is cut into strips $\frac{7}{8}$ inches wide. How many strips are there?

11. A trolley line divides its runs into zones of $3\frac{1}{2}$ miles each. How many zones are in a run of 28 miles?

12. Four boys working together gathered $31\frac{1}{3}$ quarts of chestnuts. What was each boy's share?

13. Mr. Steele has $6\frac{3}{8}$ pounds of onion seed. How many acres can he plant if each acre requires $4\frac{1}{2}$ pounds of seed?

14. Bags are made to contain $\frac{3}{8}$ pound of Christmas candy. How many bags are needed for $15\frac{1}{2}$ pounds of candy? What part of a bagful will be left? As each bag is to contain $\frac{3}{8}$ pound, what part of a pound will be left?

GENERAL TESTS

I

1. Add.

\$516.25
7.93
48.15
163.27
418.82
9.08

2. Find the average of these lengths: 5 ft., 12 ft., 7 ft., 10 ft., 11 ft.

3. From $75\frac{1}{6}$ take $58\frac{2}{3}$.

4. $\frac{1}{6}+\frac{3}{4}+\frac{2}{3}$

5. $6\frac{3}{4}\div 7\frac{1}{2}$

6. Change 75 pk. to bushels and pecks.

II

1. Add. $6\frac{1}{2}$
   $5\frac{3}{10}$
   $14\frac{1}{5}$
   $8\frac{3}{4}$
2. $16 \times 1\frac{5}{12}$
3. How many inches are in 19 ft. 11 in.?
4. Divide \$1,914.75 by 207.
5. How much must be added to $5\frac{1}{4}$ to make $10\frac{1}{6}$?

6. If $3\frac{1}{4}$ yd. of cloth is required to make a suit, how many suits can be made from $19\frac{1}{2}$ yd. of cloth?

III

1. Multiply \$17.59 by 16; subtract the product from \$300.
2. $5\frac{5}{6} \div 6\frac{1}{4}$
3. $\frac{3}{5} \times \frac{1}{16} \times \frac{8}{9}$
4. Ruth used $\frac{3}{4}$ of a piece of ribbon $1\frac{5}{9}$ yd. long for trimming. How long was the piece she used?
5. How many gallons and quarts are in 270 quarts?
6. Seventy-five persons purchased some playground supplies which cost \$321.00. How much was each one's share?

IV

1. At 14¢ a quart, how much is 5 gal. 2 qt. of milk worth?
2. Take $4\frac{5}{6}$ from the sum of $10\frac{1}{3}$ and $5\frac{1}{4}$.
3. The cost of 7 doz. pairs of canvas leggins was \$96.60. How much was this a pair?
4. Find $\frac{2}{3}$ of $\frac{3}{4}$ of $1\frac{3}{5}$.
5. Divide $5\frac{1}{3}$ by $2\frac{2}{9}$.
6. A peck of onions weighs about 13 lb. About how much will 27 bu. 3 pk. weigh?

CHAPTER V

USEFUL MEASURES

Parcel Post

Packages containing merchandise, farm and factory products, seeds, plants, books, etc., may be sent by parcel post. The charge for sending a package depends on its *weight* and the *distance* it is to go.

Using any post office as a center, the rest of the country is divided into zones. All points within 50 miles of the given office are in the first zone. All points from 50 to 150 miles away are in the second zone, and so on.

The table on page 118 shows the rates for packages of different weights according to the distances they are to go. A fraction of a pound counts as a whole pound.

Local rates are for delivery from the local post office or on rural routes starting from that office.

By the payment of a small additional fee, the sender may have a package insured against loss or damage.

Weight in Pounds	Local	Zones							
		1st Up to 50 Miles	2nd 50 to 150 Miles	3rd 150 to 300 Miles	4th 300 to 600 Miles	5th 600 to 1,000 Miles	6th 1,000 to 1,400 Miles	7th 1,400 to 1,800 Miles	8th Over 1,800 Miles
1	$0.07	$0.07	$0.07	$0.08	$0.09	$0.10	$0.11	$0.13	$0.13
2	.08	.08	.08	.10	.13	.16	.19	.23	.26
3	.08	.09	.09	.12	.17	.22	.27	.33	.38
4	.09	.10	.10	.14	.21	.28	.35	.43	.50
5	.09	.11	.11	.16	.25	.34	.43	.53	.62
6	.10	.12	.12	.18	.29	.40	.51	.63	.74
7	.10	.13	.13	.20	.33	.46	.59	.73	.86
8	.11	.14	.14	.22	.37	.52	.67	.83	.98
9	.11	.15	.15	.24	.41	.58	.75	.93	1.10
10	.12	.16	.16	.26	.45	.64	.83	1.03	1.22

From the table we see that a 7-lb. package can be sent into the third zone for 20¢. A $4\frac{1}{2}$-lb. package sent to the sixth zone is rated as a 5-lb. package and it costs 43¢.

Tell in what zones are places at the following distances from your post office.

1. 10 mi. **2.** 60 mi. **3.** 140 mi. **4.** 700 mi. **5.** 320 mi.

What is the cost of sending the following packages?

1. 3 lb. into 1st zone

2. 4 lb. into 2nd zone

3. 5 lb. into 4th zone

4. $5\frac{1}{2}$ lb. into 2nd zone

5. 10 lb. into 3rd zone

6. $9\frac{1}{4}$ lb. into 6th zone

7. In what zone is a city 78 miles from your post office? How much will it cost to send an eight-pound bundle there?

8. What is the rate for sending a $1\frac{1}{2}$-lb. package 160 mi.?

9. A man sent by parcel post a $6\frac{3}{4}$-pound package to a town 35 miles away. He gave the clerk a $2 bill. How much change did he receive?

Measures of Weight

16 ounces (oz.)	=	1 pound (lb.)
2,000 pounds	=	1 ton (T.)

The ounce and pound are used in weighing ordinary articles, such as groceries and market supplies; the ton is used in weighing larger amounts, such as hay and coal.

A *long ton*, 2,240 pounds, is often used in measuring large quantities of material, such as coal at the mines.

(Without pencil)

1. 2 lb. = ? oz.
2. $\frac{1}{4}$ lb. = ? oz.
3. 2 T. = ? lb.
4. $\frac{5}{8}$ lb. = ? oz.
5. 32 oz. = ? lb.
6. 8 oz. = ? lb.

Fill the blank spaces.

7. 20 oz. = —lb. —oz.
8. 25 oz. = —lb. —oz.
9. 2,300 lb. = —T. —lb.
10. 1,000 lb. = —T.

11. What is the difference between 40 oz. and 2 lb.? What part of a pound is this difference?

12. What is the difference in pounds between a long ton and an ordinary ton?

Change 5 lb. 11 oz. to ounces.

16	1 lb. = 16 oz.
5	5 lb. = 5 × 16 oz. = 80 oz.
80	80 oz. + 11 oz. = 91 oz.
11	
91 oz.	5 lb. 11 oz. = 91 oz.

1. Change 7 lb. 9 oz. to ounces.

2. Change 26 lb. 5 oz. to ounces.

3. A wagon loaded with coal weighs 4,000 lb. The wagon weighs 1,500 lb. How many tons of coal are in the load?

Change 156 oz. to pounds and ounces.

$$\begin{array}{r} 9 \\ 16\overline{)156} \\ \underline{144} \\ 12 \end{array}$$

16 oz. = 1 lb.

We divide 156 oz. by 16 and the quotient is 9, the number of pounds, with 12 oz. remainder. Hence: 156 oz. = 9 lb. 12 oz.

4. Change 138 oz. to pounds and ounces.

5. Change 200 oz. to pounds and ounces.

6. Change 8,850 lb. to tons and pounds.

7. Change 5,000 lb. to long tons and pounds.

8. What will be the cost of 250 lb. of potatoes at $3 a hundred pounds?

9. Mr. Robinson had four loads of coal delivered. The first load weighed 2,200 lb.; the second, 3,600 lb.; the third, 2,800 lb.; the fourth, 3,400 lb. With coal selling at $13.75 a ton, what was his bill?

10. If oatmeal is worth 8¢ a pound, for what should a package sell that contains 20 oz.?

11. A baby who weighed $8\frac{1}{2}$ lb. gained 6 oz. a week for four weeks. What was its weight at the end of the four weeks?

12. What is the cost of 3 lb. 4 oz. of dried beef at 72¢ a pound?

LOCAL PROBLEMS

Obtain necessary prices from your grocer and find the cost of these groceries. Count any fraction of a cent as a whole cent.

1.

2	lb. coffee	at ¢ —	1½	lb. butter	at ¢ —
1	doz. oranges	at — ¢ —	2½	doz. lemons	at ¢ —
1	lb. cookies	at — ¢ —	5	lb. sugar	at ¢ —
3	pk. potatoes	at ¢ —			

2.

2	loaves bread	at — ¢ —	2	lb. prunes	at — ¢ —
3	cans beans	at — ¢ —	1½	qt. milk	at — ¢ —
½	doz. bananas	at — ¢ —	2¼	lb. cheese	at — ¢ —
2	qt. molasses	at — ¢ —			

3.

2	doz. oranges	at ¢ —	1¼	lb. cheese	at ¢ —
6	cans soup	at ¢ —	3½	lb. cookies	at ¢ —
10	lb. sugar	at — ¢ —	4½	lb. raisins	at — ¢ —
3	lb. tea	at ¢ —			

4.

5	cakes soap	at — ¢ —	2	lb. crackers	at — ¢ —
4½	lb. lamb	at — ¢ —	1	gal. vinegar	at — ¢ —
2	boxes starch	at — ¢ —	4¾	lb. beef	at — ¢ —
1	bottle bluing	at — ¢ —			

Many things which were formerly measured by dry measure are now sold by weight. These weights are fixed by law in many states.

Why is it a good plan to buy and sell by weight?

	Per Bushel		Per Bushel
Apples	48 lb.	Oats	32 lb.
Beans	60 lb.	Onions	52 lb.
Corn, in ear	70 lb.	Potatoes	60 lb.
Corn, shelled	56 lb.	Wheat	60 lb.

PROBLEMS

1. How many bushels of beans are in 300 pounds?

2. One hundred pounds of potatoes are equal to how many bushels?

3. A farmer had on his wagon a load of 595 lb. of corn in the ear. How many bushels were there?

4. A car load of wheat weighs 60,000 lb. How many bushels does it contain?

5. What is the price of $4\frac{1}{2}$ bu. beans at 13¢ a pound?

6. A boy raised $12\frac{1}{4}$ bu. of onions and sold them at 4¢ a pound. How much money did he receive?

7. Mr. Field, the grocer, sold the following articles by the pound. How many pounds were there in each:

2 bu. potatoes	6 bu. apples
3 bu. shelled corn	12 bu. onions
5 bu. oats	15 bu. of wheat

Measures of Length

For short distances the foot is the unit of length, for longer distances the yard, for great distances the mile.

12 inches (in.)	= 1 foot (ft.)
3 feet	= 1 yard (yd.)
$5\frac{1}{2}$ yards	= 1 rod (rd.)
320 rods	= 1 mile (mi.)
1 mile = 1,760 yd.	= 5,280 ft.

′ is often used to represent feet. ″ is used to represent inches. Thus 4′ 6″ is read, "4 feet 6 inches."

(Without pencil)

1. What part of a foot is 6 in.? 9 in.? 8 in.?

2. What part of a yard is 9 in.? 6 in.? 18 in.? 2 ft.?

3. 2 ft. = ? in. 4 yd. = ? ft. 16 in. = ? ft. ? in.

4. $1\frac{1}{2}$ ft. = ? in. $\frac{1}{2}$ yd. = ? ft. 10 ft. = ? yd. ? ft.

5. A square is 9 in. on each side. How many feet is it around the square?

6. A flower garden is 10 yards long and 4 yards wide. How many feet long is it? How many feet wide?

7. Henry sawed 6 in. from a board 2 ft. long. How much was left in feet? in inches?

LOCAL PROBLEMS

1. Measure your desk top. What is its length in feet and inches? What is its width?

2. Find the length and width of your teacher's desk.

3. Measure the height of the blackboard on one of the walls of your schoolroom. Measure its length.

4. What is the width of each schoolroom door? of each window? What is the size of each window pane?

5. Stand against the blackboard and have some one mark your height. Now measure your height in feet and inches.

6. How tall is the tallest boy in your room? the tallest girl?

7. Find the length and width of your schoolroom in yards and feet.

8. If you can get a 50-ft. or a 100-ft. tape line, measure the width and depth of your school lot.

Change 7 ft. 9 in. to inches.

12	1 ft. = 12 inches
7	7 ft. = 7 × 12 inches = 84 in.
84	84 in. + 9 in. = 93 in.
9	7 ft. 9 in. = 93 in.
93 in.	

1. Change 9′ 8″ to inches.
2. Change 4 rd. 5 yd. to yards.
3. Change $1\frac{1}{2}$ mi. to rods.
4. Change 18 yd. 2 ft. to feet.

5. Carl and Raymond measured off a track for a hundred-yard dash. How many feet is this distance?

6. A square field is 15 rd. on a side. How many feet of fencing are required to inclose the field?

Change 98 in. to feet and inches.

$$12\overline{)98}\quad 8,\ \text{remainder } 2$$

Dividing 98 in. by 12, the number of inches in 1 ft., we get 8, the number of feet, with a remainder of 2 inches.

98 in. = 8 ft. 2 in.

7. Change 139 in. to feet and inches.

8. Change 275 ft. to yards and feet.

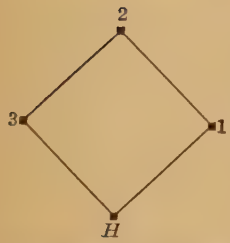
9. Jack's steps measure 26 in. How many feet and inches will he cover in 15 steps?

10. Change 329″ to feet and inches.

11. Sound travels 1,090 ft. per second. How many yards does it travel per second?

12. In an athletic meet the 100-yd. dash was run in 10 seconds. How many feet did the runner average per second?

A Baseball Game



1. A baseball diamond is 90 feet on each side. How far is it around the diamond in feet? in yards?

2. How far is it around to third base?

3. There were 30 boys on the baseball field. After two baseball nines had been chosen, how many boys were left over?

4. How many boys would be needed to go with those left over to make two more baseball nines?

5. The boys have brought with them two balls worth 35¢ each and three bats worth 75¢ each. How much are these balls and bats worth?

6. It is 127 feet from home plate to second base and 119 feet more from second base to the end of the field. How far is it from home plate down to the end of the field?

7. The first time he came to the bat, Joe Peters knocked the ball straight down the field so that it landed 169 ft. from home plate. How near the end of the field did it land?

The table given below shows the number of runs made by Tom's team and by Joe's team in each of the nine innings.

	1	2	3	4	5	6	7	8	9
TOM'S TEAM	2	0	3	1	2	4	2	6	3
JOE'S TEAM	1	3	1	2	0	3	5	4	5

8. Which team was ahead at the end of the fifth inning?

9. Which team won the game?

Drawing to a Scale

Drawings of objects, plots of land, or plans of buildings are made to some scale, so that all the lines and distances on the drawing have the same relation to each other that distances do in the object represented. A plan of a lot may be made so that 1 inch on the plan represents 10 feet on the lot. A plan of a building may be drawn so that $\frac{1}{8}$ in. on the plan is equal to 1 ft. on the building. Different scales may be used in different drawings, but the same scale is used throughout on the same drawing.

If a scale is given as $\frac{1}{5}$, it means that every distance on the drawing represents 5 times that distance in the original object. The scale $2'' = 1'$, means that 2 inches on the drawing represent 1 foot on the object.

1. If 1 inch represents 10 feet, tell what distances are represented:

By the line AB A——————————B

By the line CD C——————————D

By lines of the following lengths: 4 in.; $3\frac{1}{2}$ in.; $5\frac{1}{2}$ in.; $7\frac{1}{4}$; $12\frac{1}{2}$.

2. With the scale $1'' = 8'$, give the distances represented by lines of the following lengths: 3 in.; $2\frac{1}{2}$ in.; $1\frac{3}{4}$ in.; $3\frac{1}{8}$ in.

3. Using the scale $\frac{1}{4}'' = 1'$, draw lines representing the following distances: 4 ft.; 6 ft.; 8 ft.; 11 ft.; 2 ft.

4. Letting 1 inch represent 10 feet, draw lines which represent the following distances: 20 ft.; 5 ft.; 35 ft.; $2\frac{1}{2}$ ft.

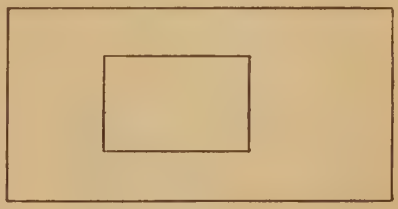
5. Measure the length and the width of the top of your desk, to the nearest inch. Then draw a plan of the desk top to the scale $\frac{1}{8}$.

6. Measure the length and the width of your schoolroom, to the nearest foot. Draw a plan of the room, using the scale your teacher suggests.

The Carrs' New House

The Carrs have bought a new house.

Here is a plan of the house and lot, drawn to the scale 1 inch = 60 feet.



1. Find the length and width of the lot.

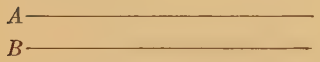
2. Find the size of the house.

3. How far is the house from each side of the lot?

4. Alice Carr wishes to have a flower garden 18 ft. long and 8 ft. wide. Draw a plan of this garden, letting $\frac{1}{4}$ inch represent 1 foot.

SQUARE MEASURE

Parallel lines are straight lines on the same surface which cannot meet, however far they may be extended in either direction.

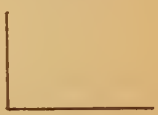


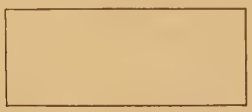
A and *B* are parallel lines.

Find some parallel lines in your schoolroom.

When two lines meet they form an *angle*. *A* is an angle. The angle is the opening between the two lines. The meeting point of the two lines is the *vertex* of the angle.

When two lines meet to form a square corner, like the corner of this page, they form a *right angle*. See how many right angles you can find in your schoolroom.





A *rectangle* is a figure which has four sides and four right angles. The opposite sides of a rectangle are parallel and equal.

A *square* is a rectangle with all four sides equal.

A *square foot* is a square one foot on each side.

Draw a square foot on the blackboard.

What is a square yard? a square rod? a square mile?

Measure off a square yard on the schoolroom floor.

Measure off a square rod, and have a boy stand at each corner of the square.

The *area* of a figure is the number of square units it contains.

This figure represents a rectangle 4 inches long and 3 inches wide. How many square inches are there in the first row? How many rows are there? How many square inches are there in all? What is the area of this rectangle? How many square inches are there in the first column? How many columns are there? What is the area?

The area is 3×4 sq. in. $= 12$ sq. in.
or, 4×3 sq. in. $= 12$ sq. in.

Before finding the area of a rectangle, both the length and the width must be expressed in terms of the same unit; that is, both must be in inches, or both in feet, etc.

To find the area of a rectangle, multiply the number of units of its length by the number of units of its width; express the results in square units of measure.

What is the area of a room 18 ft. long and 12 ft. wide?
$18 \times 12 = 216$. The area is 216 sq. ft.

A rectangle 8 ft. long and 7 ft. wide is often written: "a rectangle 8 ft. $\times$ 7 ft."; or, "a rectangle $8' \times 7'$." It is read, "a rectangle 8 feet by 7 feet."

1. What is the area of a room 15 feet long and 14 feet wide?

2. Find the area of a wall 12 ft. $\times$ 10 ft.

3. What is the area of a sidewalk 2 yd. wide by 18 yd. long?

Find the area of a table 4 ft. 6 in. by 2 ft. 4 in.

4 ft. 6 in. $= 4\frac{1}{2}$ ft. 2 ft. 4 in. $= 2\frac{1}{3}$ ft.

$$4\tfrac{1}{2} \times 2\tfrac{1}{3} = \frac{\overset{3}{\cancel{9}}}{2} \times \frac{7}{\underset{1}{\cancel{3}}} = \frac{21}{2} = 10\tfrac{1}{2}$$

The area is $10\frac{1}{2}$ sq. ft.

Find the area of

4. A room 12 ft. 6 in. $\times$ 20 ft.
5. A table 4 ft. by 3 ft. 6 in.
6. A door $2\frac{1}{2}' \times 6'$.
7. A rug 9 ft. by 12 ft.
8. A window 5′ 6″ by 2′ 6″.
9. A platform 6′ $\times$ 8′ 6″.
10. Find the area of one of your blackboards.
11. Find the area of your schoolroom.

144 square inches (sq. in.)	= 1 square foot (sq. ft.)
9 square feet	= 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards	= 1 square rod (sq. rd.)
160 square rods	= 1 acre (A.)
640 acres	= 1 square mile (sq. mi.)

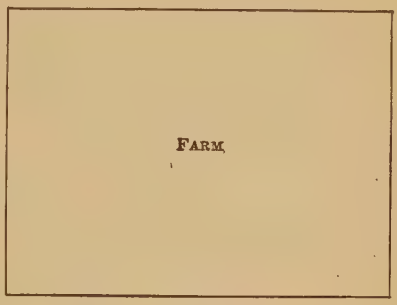
1 acre = 160 sq. rd. = 4,840 sq. yd. = 43,560 sq. ft.

A square lot 208 ft. on each side is nearly an acre.

1. A room is $5\frac{1}{2}$ yards long and 4 yards wide. How many square feet does its floor contain?
2. A room is 21′ $\times$ 15′. Give its area in square yards.
3. How many square feet are there in a mirror 18″ $\times$ 24″?
4. Arthur's father made a skating rink for him that measured 29′ $\times$ 34′. What was the area of the rink in square yards and square feet?

Mr. Peterson's Farm

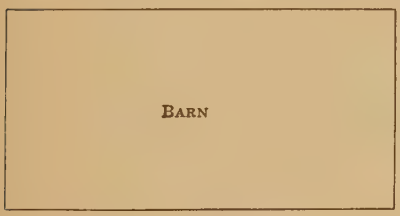
1. The following plan of Mr. Peterson's farm is drawn to the scale $1'' = 40$ rd. Measure it. What is the area of the farm in acres? What is it worth at \$55 an acre?



2. Mr. Peterson has a potato field of 6 acres. How many square rods does it contain?

3. One of Mr. Peterson's corn fields is plotted to the scale of 1 in. to 10 rd. The plot is 3 in. long by 2 in. wide. How many acres are there in the field?

4. Here is a plan of Mr. Peterson's barn drawn to the scale $1'' = 30$ ft. A concrete floor for the barn cost \$2.75 per square yard. What was the total cost of the floor?



5. How many square yards are in his barnyard, if it measures 4 rods by 8 rods?

6. The wood lot is 20 rd. $\times$ 30 rd. Draw a plan of it using the scale $1'' = 8$ rd. Find the area of the wood lot in acres.

7. A neighbor's farm runs 40 rd. along the road and it is 56 rd. deep. How many acres does it contain? How much larger is Mr. Peterson's farm?

8. Find the cost of the neighbor's farm at \$62 an acre.

CHAPTER REVIEWS

PROCESS REVIEW

1. What is meant by drawing to a scale? Explain what these scales mean: $1'' = 10'$; 1 inch to 20 rd.; $\frac{1}{2}'' = 1''$.

2. Knowing the scale used, how can you find distances by measuring the drawing?

3. How do you find the area of a rectangle?

4. What is the general method of changing from a higher denomination to a lower? from a lower to a higher?

DRILL EXAMPLES

1. Change 9 lb. 5 oz. to ounces.
2. Change 8 rd. 4 yd. to yards.
3. Change 31 yd. to inches.
4. Change 103 in. to feet and inches.
5. Change 207 oz. to pounds and ounces.
6. Change 1,709 ft. to yards and feet.

Find the area of the following rectangles.

7. $37' \times 29'$
8. 5 ft. 3 in. by 3 ft. 4 in.
9. $3'\ 9''$ by $5'\ 4''$
10. 51 yd. by $25\frac{1}{3}$ yd.
11. A plan of a lot, drawn to the scale $1'' = 8'$, is 7 in. wide and $12\frac{1}{2}$ in. long. How wide and deep is the lot?
12. A farm is 60 rd. along the road and 110 rd. deep. What is the size of a plan of the farm drawn to the scale 1 ft. to 20 rd.?

GENERAL PROBLEMS

1. How much will it cost to put a hardwood floor on a room 13 ft. by 15 ft. at \$.60 per square foot?

2. How much will it cost to cover a room 15 ft. by 18 ft. with linoleum at \$2.25 per square yard?

3. Find the cost of a farm 70 rd. by 96 rd. at \$95 an acre.

4. A sidewalk is 6 ft. wide and 48 ft. long. What will be the cost of concreting it at \$2.50 per square yard?

5. How much will it cost to plaster the ceiling of a room $18' \times 21'$ at \$.50 per square foot?

6. Here is a drawing of a piece of bakelite on which to mount radio apparatus. It is drawn to the scale 1 to 6. Find the cost of this piece of bakelite at $2\frac{1}{2}¢$ a square inch.

7. A farmer built a large chicken house and used the following materials. What was the cost?

Lumber . . .	\$57.50
2 rolls roofing @ .	3.00 a roll
$5\frac{1}{2}$ lb. nails @ . .	.10 a pound
3 lb. spikes @ . .	.15 a pound
4 bags cement @ .	1.75 a bag
2 windows @ . .	2.00 each
50 ft. wire @ . .	.18 a foot

8. A piece of wire screen is $2\frac{1}{2}' \times 5'$. Find its cost at $3\frac{1}{2}¢$ a square foot.

GENERAL TESTS

I

1. Subtract. $502.06 − 138.98

2. Add. $15\frac{1}{4}$, $13\frac{1}{2}$, $29\frac{2}{5}$

3. Change 11′ 4″ to inches.

4. Change 5 A. to sq. rd.

5. $30\frac{1}{5} - 8\frac{1}{4}$

6. A plan of a barn is 4 in. wide and 5 in. long. If the plan is drawn to the scale 1″ = 8′, how large is the barn?

II

1. Add.

	$613.75
	426.14
	78.09
	315.80
	43.18
	128.26
	5.35
	282.15

2. $935.00 ÷ 34

3. Find the area of a table top 1 ft. 6 in. wide and 26 in. long.

4. Find the cost of 350 barrels of apples at $4.75 a barrel.

5. Draw the plan of a room 12′ × 16′, using the scale $\frac{1}{8}'' = 1'$.

6. The sides of a pasture are 450 ft., 618 ft., 513 ft., and 735 ft. How many yards of fencing are needed to go around it?

III

1. Divide 73,902 by 226.

2. Using the scale $\frac{1}{4}'' = 1'$, draw lines representing the following lengths: 2 ft., 6 ft., 10 ft., 12 ft., 15 ft.

3. $\frac{2}{3} + \frac{5}{6} + \frac{1}{2} + \frac{3}{4}$ 4. $5\frac{1}{4} \div \frac{3}{10}$ 5. $\frac{3}{8} \times 2\frac{2}{9} \times \frac{4}{5}$

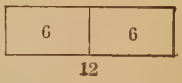
6. On a large map $\frac{1}{2}$ in. represents a mile. How far apart are two towns that are 1 inch apart on the map? two cities that are $2\frac{1}{2}$ in. apart on the map?

CHAPTER VI

APPLICATIONS OF FRACTIONS; DECIMAL NUMBERS

KNOWING A PART, TO FIND THE WHOLE

One whole is how many halves? By what must you multiply one half of anything to get the whole? One half of a number is 6; what is the number?



Two times one half of a number equals the whole number.

1. 9 is $\frac{1}{2}$ of —?
2. 12 is $\frac{1}{2}$ of —?
3. 15 is $\frac{1}{2}$ of —?
4. 20 is $\frac{1}{2}$ of —?
5. 16 = $\frac{1}{2}$ of —?
6. 50 = $\frac{1}{2}$ of —?

How many thirds does it take to make a whole? By what must you multiply one third of anything to get the whole of it?

Three times one third of a number equals the whole of it.

1. 4 is $\frac{1}{3}$ of —?
2. 8 is $\frac{1}{3}$ of —?
3. 7 is $\frac{1}{3}$ of —?
4. 20 is $\frac{1}{3}$ of —?
5. 13 = $\frac{1}{3}$ of —?
6. 50 = $\frac{1}{3}$ of —?

How can you find a number if you know $\frac{1}{4}$ of it? $\frac{1}{5}$ of it? $\frac{1}{8}$ of it? $\frac{1}{6}$ of it? $\frac{1}{7}$ of it?

Tell the number of which

1. 8 is $\frac{1}{6}$.
2. 7 is $\frac{1}{4}$.
3. 4 is $\frac{1}{6}$.
4. 9 is $\frac{1}{4}$.
5. 6 is $\frac{1}{5}$.
6. 3 is $\frac{1}{7}$.
7. 12 is $\frac{1}{5}$.
8. 8 is $\frac{1}{6}$.
9. 20 is $\frac{1}{5}$.
10. 75 is $\frac{1}{2}$.
11. 34 is $\frac{1}{5}$.
12. 50 is $\frac{1}{7}$.
13. 53 is $\frac{1}{4}$.
14. 62 is $\frac{1}{6}$.
15. 116 is $\frac{1}{5}$.

PROBLEMS

1. Mary has 17 white hens. This is one fourth of all the hens she has. How many has she?

2. On Friday afternoon John sold 39 magazines. This is one half the number he sold on Saturday. How many magazines did he sell on Saturday?

3. Rachel has read 47 pages of a book. This is one third of the book. How many pages are in it?

4. On a trip from their home to Chicago, the Johnsons have driven 78 miles. This is one half of the distance. How far is it from their home to Chicago?

5. A man pays $35 rent a month. This is one fifth of what he earns each month. What are his monthly earnings?

6. There are 40 children in the fifth grade. This is one tenth of the number of children in the school. How many children are in the school?

7. Elizabeth has $1.50 to put in the bank. This is one eighth of the amount she already has in the bank. How much money has she in the bank?

SIMPLE PERCENTAGES AS FRACTIONS

We have already seen that one whole is equal to $\frac{3}{3}$, or $\frac{4}{4}$, or $\frac{15}{15}$, or any fraction where the numerator and the denominator are the same. In the same way, we can say that one whole is equal to $\frac{100}{100}$. Another name for $\frac{100}{100}$ is 100 per cent; the words *per cent* mean *by the hundred.* Another way of writing 100 per cent is 100%, the sign, %, being read *per cent.*

FIFTY PER CENT

In the figure on page 136, we see that one whole = 100%. Now, if we divide one whole into two equal parts, each part will be equal to $\frac{1}{2}$ of 100%, or 50% of the whole. From this figure we see that: 50% = $\frac{1}{2}$.

If anything is divided into two equal parts, each of the parts is equal to 50% of the whole. In the following examples we shall consider 50% as the same as $\frac{1}{2}$.

(Without pencil)

1. How much is 50% of each of the following numbers?

   8 6 12 9 7 11 15

2. How much is 100% of 8? of 27? of 35? of 9? of 150?

3. 4 is $\frac{1}{2}$ of what number? 4 is 50% of what number?

4. 6 is 50% of —? 30 is 50% of —?
   8 is 50% of —? 25 is 50% of —?

5. Albert had 10 coins and 50% of them were dimes. How many dimes did he have?

6. Rachel has 12 hair ribbons. She received 50% of them on birthdays. How many were birthday gifts?

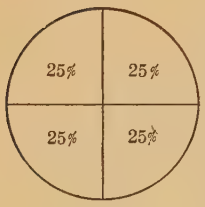
7. David has 18 paper customers and 50% of these live on the hill. How many hill customers has he?

8. There are 24 pictures in a color book. Grace has colored 50% of them. How many has she colored?

9. Jack has $72 in the bank. He earned 50% of it. How much of the money did he earn?

10. $75 is 50% of what amount?

TWENTY-FIVE PER CENT



If we divide anything into four equal parts, we know that the sum of the parts must equal the whole, or 100%; hence, each part must equal $\frac{1}{4}$ of 100%, or 25%.

From the figure we see that $25\% = \frac{1}{4}$.

(Without pencil)

1. How much is 25% of each of the following numbers?

   8 20 12 100 120

2. 2 is $\frac{1}{4}$ of what number? 2 is 25% of what number?

3. 4 is 25% of —? 8 is 25% of —?

   10 is 25% of —? 12 is 25% of —?

4. Mr. Jones has a farm of 20 acres, of which 25% is pasture land. How many acres of pasture land has he?

5. Our school team played 12 baseball games one season and lost only 25% of the games. How many games did it lose? How many did it win?

6. There are 24 girls in Miss Johnson's room and 25% of them live on Walnut Street. How many of the girls live on that street?

7. Louis had 40¢ and he spent 25% of it for a ball. How much did the ball cost?

8. A girls' club took in $16 at an entertainment. Twenty-five per cent of this amount was used for expenses. How much did the girls make?

9. John has $7 saved toward buying a bicycle. This is 25% of the cost of the bicycle. Find the cost.

THIRTY-THREE AND ONE THIRD PER CENT

If anything is divided into three equal parts, each part is $\frac{1}{3}$ of 100%, or $33\frac{1}{3}\%$ of the whole. $33\frac{1}{3}\% = \frac{1}{3}$.

(Without pencil)

1. How much is $33\frac{1}{3}\%$ of 6 balls? of 15 oranges? of 9 cents? of 12 marbles?

2. Find $33\frac{1}{3}\%$ of each of the following numbers.

30 15 27 1 33 60 120

3. Charles earned \$6 one month selling papers. He invested $33\frac{1}{3}\%$ of his earnings in postal savings stamps. How much money did he spend for stamps?

4. Two marbles are one third of how many marbles?

5. 7 is $33\frac{1}{3}\%$ of what number? 5 is $33\frac{1}{3}\%$ of —?

6. Nine books are $33\frac{1}{3}\%$ of how many books?

7. Arthur has 9 examples in arithmetic for tomorrow. He did $33\frac{1}{3}\%$ of them in school and the rest at home. How many did he do in school?

8. Lucy's father raised 24 bushels of potatoes one summer. He kept $33\frac{1}{3}\%$ for his own use and sold the rest. How many bushels did he keep? How many bushels did he sell?

9. During the month of April (30 days) it rained on $33\frac{1}{3}\%$ of the days. How many days were stormy?

10. In 15 pounds of mixed nuts, $33\frac{1}{3}\%$ of the amount were almonds. How many pounds of almonds were in the mixture?

SEVENTY-FIVE PER CENT

If anything is divided into four equal parts, three of the parts make $\frac{3}{4}$ of 100%, or 75% of the whole. That is, $75\% = \frac{3}{4}$.

What part of a circle is 75% of it? 75% of a line is what part of the line? Show these by diagrams.

(Without pencil)

1. What part of anything is 25% of it? 50% of it? 75% of it?

2. How much is 75% of 12 boxes? of 16 girls? of \$4? of 24 yards?

3. A man bought a set of books for \$8. He sold them later for 75% of their cost. For what did he sell them?

4. How much is 75% of 8 sheep? of 20 pencils? of 400 books?

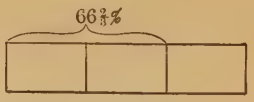
5. How much is 25% of 28? 50% of 28? 75% of 28? 100% of 28?

6. Sarah's mother gave her a piece of narrow red ribbon 16 feet long. She used 75% of it to tie up packages. How much did she use in this way?

7. Mr. Whipple has a young apple orchard of 32 trees and 75% of them bore fruit last year. How many of the trees had apples on them?

8. There were 28 people on a trolley car when it reached the baseball field and 75% of them got off. How many were left on the car?

SIXTY-SIX AND TWO THIRDS PER CENT



If anything is divided into three equal parts, two of the parts make $\frac{2}{3}$ of 100%, or $66\frac{2}{3}\%$ of the whole. That is, $66\frac{2}{3}\% = \frac{2}{3}$.

(Without pencil)

1. How much is $66\frac{2}{3}\%$ of 6 oranges? of 12 cards? of 9 buttons? of 15 crayons?

2. Ralph is 9 years old and James is only $66\frac{2}{3}\%$ as old. How old is James?

3. Find $66\frac{2}{3}\%$ of each of the following numbers.

6 15 9 21 33 27 300

4. $66\frac{2}{3}\%$ of a cake has been eaten. What part has been eaten? What part is left?

5. How much is $33\frac{1}{3}\%$ of 18? $66\frac{2}{3}\%$ of 18? 100% of 18?

6. There are 30 pupils in Miss Scott's room and $66\frac{2}{3}\%$ of them went on a hike. How many boys and girls went on the hike?

7. Margaret had 15 postal savings stamps. She pasted $66\frac{2}{3}\%$ of them on her card and gave the others to her brother for a birthday present. How many did she give her brother?

8. It is 18 miles by road from Donald's house to the city and $66\frac{2}{3}\%$ of the way is state road. How much of the way is state road?

9. A new bicycle costs \$30, but William's father bought a nearly new one for him for $66\frac{2}{3}\%$ of that amount. How much did William's bicycle cost?

1. Find 50% of 56; of 90; of 112; of 246.

2. Find 25% of 68; of 96; of 132; of 260.

3. Find $33\frac{1}{3}\%$ of 54; of 81; of 117; of 258.

4. Find 75% of 72; of 92; of 116; of 172.

5. Find $66\frac{2}{3}\%$ of 48; of 78; of 108; of 123.

6. How much is 50% of 132? $33\frac{1}{3}\%$? 25%? $66\frac{2}{3}\%$? 100%?

7. 65 is 50% of what number?

8. 73 is 25% of what number?

9. 82 is $33\frac{1}{3}\%$ of what number?

10. 114 is $33\frac{1}{3}\%$ of —? 50% of —? 25% of —?

11. A farmer raised 146 bushels of potatoes and sold 50% of them in the fall. How many did he sell in the fall?

12. A wholesale dealer had 138 melons and Mr. Field bought $33\frac{1}{3}\%$ of them. How many did Mr. Field buy?

13. One year a city set out 165 bushes in a park. $66\frac{2}{3}\%$ of them were rosebushes. How many rosebushes were set out in the park?

14. During one day 320 children rode on a merry-go-round. 75% of these rode in the afternoon. How many children rode in the afternoon?

15. One Fourth of July night 346 persons attended the neighborhood fireworks. Fifty per cent of these were children. How many children were present?

16. A school entertainment cleared $104. Seventy-five per cent of this amount was given to the athletic association. How much did the athletic association receive?

17. One summer Ralph and his father went on a 132-mile trip. They rode $66\frac{2}{3}\%$ of the distance on the trolley. What distance did they cover by trolley?

18. James built a new hen-coop and put 48 chickens in it. This is $33\frac{1}{3}\%$ of his chickens. How many chickens has he?

19. Ruth has 29 foreign postcards in her book. This is 25% of her cards. How many cards has she?

ALIQUOT PARTS OF A DOLLAR

What part of a dollar is 50¢? What part of a dollar is 25¢? What part of a dollar is 75¢?

What would be the cost of 28 yards of cloth at \$1 a yard? at 50¢ a yard? at 25¢ a yard? at 75¢ a yard?

What part of a dollar is $33\frac{1}{3}$¢? What part of a dollar is $66\frac{2}{3}$¢?

What would be the cost of 12 knives at \$1 apiece? at $33\frac{1}{3}$¢ apiece? at $66\frac{2}{3}$¢ apiece?

$50¢ = \$\frac{1}{2}$; $25¢ = \$\frac{1}{4}$; $75¢ = \$\frac{3}{4}$; $33\frac{1}{3}¢ = \$\frac{1}{3}$; $66\frac{2}{3}¢ = \$\frac{2}{3}$.

It often simplifies examples to consider these amounts as fractional parts of a dollar.

A. What is the cost of 68 files at 50¢ apiece?

$$\overset{34}{\cancel{68}} \times \$\frac{1}{\cancel{2}} = \$34.$$

B. What are 148 yards of cloth worth at 75¢ a yard?

$$\overset{37}{\cancel{148}} \times \$\frac{3}{\cancel{4}} = \$111.$$

Without using pencil, find the cost of the following numbers of articles at the prices indicated.

1. 6 at $33\frac{1}{3}¢$
2. 12 at $25¢$
3. 22 at $50¢$
4. 9 at $66\frac{2}{3}¢$
5. 16 at $75¢$
6. 18 at $66\frac{2}{3}¢$

Find the cost of the following articles.

1. 60 at $50¢$
2. 48 at $25¢$
3. 54 at $33\frac{1}{3}¢$
4. 90 at $66\frac{2}{3}¢$
5. 44 at $75¢$
6. 25 at $50¢$
7. 45 at $66\frac{2}{3}¢$
8. 240 at $33\frac{1}{3}¢$
9. 160 at $75¢$

PROBLEMS

1. What is the cost of 40 doz. lemons at $25¢$ a dozen?

2. A grocer bought 48 melons at $66\frac{2}{3}¢$ apiece. How much did he have to pay for them?

3. A laborer worked 72 hours at $75¢$ an hour. How much did he receive for his labor?

4. A boys' club ordered 108 badges at $33\frac{1}{3}¢$ apiece. How much did they cost?

5. One day a druggist sold 118 pounds of candy at $50¢$ a pound. How much did he receive for this candy?

6. How much did a storekeeper have to pay for 180 small flags at the wholesale price of $66\frac{2}{3}¢$ apiece?

7. A storekeeper ordered 2 doz. baseball bats at $75¢$ each. How much did they cost?

8. Find the cost of a dozen pairs of stockings at $33\frac{1}{3}¢$ a pair.

9. Six hundred persons bought tickets for an entertainment at $50¢$ each. How much money was taken in?

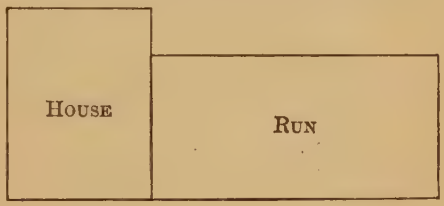
Poultry Raising

1. Bob Adams bought 200 eggs for $30 and 5 gal. of oil for his incubator at 20¢ a gallon. How much did he spend?

2. In three weeks 175 eggs hatched and he sold the chicks at 25¢ apiece. How much did he receive for them?

3. How much more did he receive than he paid out?

4. Jack Ware has 10 hens. This is the plan of his chicken house and chicken run, drawn to the scale $\frac{1}{8}$ in. = 1 ft. Find the length and width of the house; of the run.



5. In April Jack bought 25 lb. of mash at 3¢ a pound, 50 lb. of scratch at 3¢ a pound, and $2\frac{1}{2}$ lb. of oyster shells at 2¢ a pound. How much did he pay out in April?

6. He sold 156 eggs at 45¢ a dozen. How much money did he make in April?

7. In May he bought 50 lb. of mash at $3\frac{1}{2}$¢ a pound, 25 lb. of scratch at 3¢ a pound, 5 lb. of oyster shells at 2¢ a pound. What were his May expenses?

8. He sold $15\frac{1}{2}$ doz. eggs at 42¢ a dozen. How much did he make in May?

A Girls' Club

1. There are 24 members of the Park Girls' Club. Fifty per cent of the girls are charter members. How many charter members are there in the club?

2. The dues of the club are ten cents a month. How much does this amount to each month? in a year?

3. Seventy-five per cent of the members went on a hike last Saturday. How many girls went on the hike?

4. How much did pins for the club cost at 50¢ each?

5. The club met last week on a stormy afternoon. Twenty-five per cent of the girls could not attend the meeting. How many of the members were present?

6. Twenty-two members of the club go to the Elmwood School. This is one eighth of the number of girls in that school. How many girls attend the Elmwood School?

7. Sixty-six and two thirds per cent of the club members have bicycles. How many of the girls have bicycles?

8. The girls have raised \$8 to decorate their clubroom. This is $33\frac{1}{3}\%$ of the amount they intend to raise. How much money do they intend to raise for decorations?

DECIMAL NUMBERS

A New Way of Writing Tenths and Hundredths

When anything is divided into 10 equal parts, what is one of the parts called?

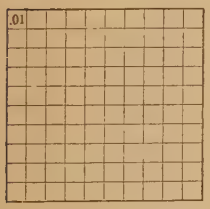
A new way of writing $\frac{1}{10}$ is .1.

The expression .1 is called a *decimal fraction.* The point in front of the 1 is a *decimal point.*

In like manner, $.3 = \frac{3}{10}$ and $.5 = \frac{5}{10}$.

One unit, or $\frac{10}{10}$, is written 1 or 1.0, meaning "1 unit *and* no tenths," the word *and* being read at the decimal point.

Two units and three tenths of a unit is written 2.3. It is read, "two and three tenths."



When anything is divided into 100 equal parts, what is one of the parts called?

The decimal way of writing $\frac{1}{100}$ is .01.

In like manner, $.04 = \frac{4}{100}$, and $.37 = \frac{37}{100}$.

18.37 is read, "eighteen and thirty-seven hundredths."

Read the following decimal numbers.

1.	.4	.02	.65	.7	.09	.6
2.	1.17	4.3	25.4	9.08	47.28	5.49

Write these numbers in decimal form.

1. Eight tenths
2. Fifteen hundredths
3. Seven and six tenths
4. Fifty-one hundredths
5. Forty-six hundredths
6. Twenty and four hundredths
7. Two hundred six and three tenths
8. One hundred two and two hundredths

ADDITION OF TENTHS AND HUNDREDTHS

Add.	*A.*	.3	*C.*	5.6	*E.*	6.87	*G.*	2.67
		.2		2.8		2.54		4.7
		.5		8.4		9.41		5.08
	B.	.7	*D.*	.09	*F.*	4.6		6.39
		.5		.64		2.75		12.5
		1.2		.73		7.35		31.34

To add decimal numbers, place them so that the decimal points are in vertical line, add as with ordinary numbers, and place a decimal point in the sum directly under the other decimal points.

Without using pencil, add.

1.	.5	.7	.4	.8	.6	.7
	.1	.2	.4	.4	.9	.3
2.	.07	.32	.05	.6	.75	.65
	.09	.06	.45	.24	.5	.35

Using pencil, add.

1.	4.7	**2.**	9.5	**3.**	10.65	**4.**	21.8	**5.**	38.67
	1.5		8.9		15.8		14.2		11.79
6.	4.31	**7.**	.28	**8.**	5.19	**9.**	3.21	**10.**	38.
	.15		4.		6.24		1.08		7.76
	3.18		8.5		8.		11.23		22.8
	7.		1.67		2.87		5.9		16.54

Arrange properly in columns and add.

11. 4.37, 9.27, 6.5, 148

12. 6.23, .66, 12.4, 7, 6.19

13. 22.76, 6.13, 9.9, 32.76

14. 4.03, 47, 2.6, 15.68, .5

Changing Tenths to Hundredths

Changing $\frac{4}{10}$ to hundredths we get, $\frac{4}{10} = \frac{40}{100}$; that is, .4 = .40.

To change tenths in decimal form to hundredths, annex a 0 to the tenths.

Read these as hundredths.

.5 .3 .7 .2 .8 4.6 13.5 20.6

SUBTRACTION OF TENTHS AND HUNDREDTHS

Subtract.

A.	*B.*	*C.*	*D.*	*E.*
.8	9.4	.24	42.31	31.4
.5	3.8	.16	17.97	15.83
.3	5.6	.08	24.34	15.57

In *E* we consider 31.4 as if it were written 31.40.

To subtract decimal numbers, place them so that the decimal points are in a vertical line, subtract as with ordinary numbers, and place a decimal point in the difference under the other decimal points.

Without using pencil, subtract.

.7	.9	.06	.15	6.4	8.53
.2	.5	.03	.07	4.1	2.1

Subtract.

1. 8.2	**3.** 43.0	**5.** 90.	**7.** 32.6	**9.** 71.
1.7	25.4	65.8	19.78	50.43
2. 15.4	**4.** 84.3	**6.** 9.15	**8.** 53.00	**10.** 50.
5.6	76.5	5.67	31.12	48.69

11. 151.04 − 113.7 **12.** 215 − 187.49 **13.** 340 − 122.16

MULTIPLICATION OF TENTHS AND HUNDREDTHS BY INTEGERS

Multiply.

A.	*B.*	*C.*	*D.*
.2	.6	4.7	8.31
4	3	6	14
.8	1.8	28.2	3324
			831
			116.34

To multiply a decimal number by an integer, multiply as with ordinary numbers and point off as many decimal places in the product as there are in the given decimal number.

Multiply.

1. .8	**3.** 2.6	**5.** 8.5	**7.** 15.2	**9.** 38.4
6	4	7	16	36
2. 36	**4.** 45	**6.** 24.5	**8.** 32.8	**10.** 42.9
.3	.9	6	25	23

11. 6×7.09	**14.** 15×5.28	**17.** 28×27.92
12. 4×12.24	**15.** 25×16.04	**18.** 40×63.05
13. 8×16.35	**16.** 36×15.25	**19.** 480×7.95

20. One side of a square lot is 75.6 ft. What is the distance around the lot?

21. Mr. Jones rides back and forth each week day to the city, 6.75 miles away. How much does this amount to in a week?

22. A dealer bought 50 coaster wagons at \$7.95 each. Find the cost.

DIVISION OF TENTHS AND HUNDREDTHS BY INTEGERS

A.	*B.*	*C.*	*D.*
.4	.7	.08	5.34
2)$\overline{.8}$	6)$\overline{4.2}$	3)$\overline{.24}$	7)$\overline{37.38}$

In *C* the tenths place of the quotient is filled in with a 0.

To divide a decimal number by an integer, divide as with ordinary numbers and place a decimal point in the quotient directly over the decimal point in the dividend.

(Without pencil)

1. .6 ÷ 3 .9 ÷ 3 .7 ÷ 7 .5 ÷ 1 .6 ÷ 2

2. .24 ÷ 2 .28 ÷ 7 .32 ÷ 4 .30 ÷ 5 .48 ÷ 3

(With pencil)

1. 2)$\overline{1.6}$ **4.** 4)$\overline{10.4}$ **7.** 7)$\overline{41.3}$ **10.** 6)$\overline{49.8}$

2. 8)$\overline{7.2}$ **5.** 6)$\overline{22.8}$ **8.** 5)$\overline{71.5}$ **11.** 9)$\overline{51.3}$

3. 3)$\overline{13.2}$ **6.** 4)$\overline{29.2}$ **9.** 8)$\overline{65.6}$ **12.** 12)$\overline{63.6}$

13. .72 ÷ 6 **16.** 36.24 ÷ 8 **19.** 216.00 ÷ 32

14. 8.65 ÷ 5 **17.** 89.88 ÷ 14 **20.** 234.00 ÷ 25

15. 13.86 ÷ 6 **18.** 130.5 ÷ 18 **21.** 659.1 ÷ 78

The School Playground

1. On the playground there are three slippery slides. Each one cost $33.85. How much did all three cost?

2. For the giant stride the pole measures $11\frac{3}{4}$ feet above the ground and it extends $5\frac{1}{2}$ feet below the ground. How long is this pole?

3. On the giant stride there are six link swings, each requiring $5\frac{1}{4}$ feet of chain and $10\frac{1}{2}$ feet of rope. How much

chain and how much rope were used in making the giant stride?

4. There is a big paddle pond on the playground. It is 125 feet long and 40 feet wide. What is the area of the surface of the pond?

5. One afternoon 100 children were in the pond at the same time. How many square feet did this allow for each child?

6. The pond is $6\frac{1}{2}$ inches deep at the edge and 3 feet deep in the center. How much deeper is it in the center than at the edge?

7. The inclosed sand pile is 40 feet long and 3 yards wide. How many feet is it around the sand pile? How many yards?

8. The following lengths of pipe were needed to build the frame for six swings: 3 pieces $15\frac{1}{2}$ feet long, 2 pieces

15 feet long, and 4 pieces $18\frac{3}{4}$ feet long. How many feet of iron pipe were required?

9. For each of these swings 2 pieces of rope $10\frac{5}{6}$ feet long are required. How much rope is used for all the swings?

10. The city bought a horizontal bar outfit for $26.25, twelve traveling rings at $4.65 each, two basketball backstops at $23.45 each, and a special playground basketball at $12.50. How much did this equipment cost?

11. The traveling rings hang from a bar which is 16 feet above the ground and the distance from this bar to the bottom of the rings is $10\frac{1}{3}$ feet. How high are the rings above the ground?

12. During one week in July the attendance at the playground was as follows:

	Morning	Afternoon	Evening	Totals
Monday	153	449	240	
Tuesday	200	456	287	
Wednesday	288	446	311	
Thursday	169	393	341	
Friday	125	360	258	
Saturday	97	191	134	
Totals				

What was the total morning attendance during the week? the total afternoon attendance? the total evening attendance?

How much was the total attendance each day?

CHAPTER REVIEWS

PROCESS REVIEW

1. If you know one half of a number, how can you find the number?

2. How can you find a number if you know one third of it? one fourth of it? one sixth of it? one fifth of it?

3. What part of anything is 50% of it? 25%? 75%?

4. What part of anything is 100% of it?

5. What part of anything is $33\frac{1}{3}\%$ of it? $66\frac{2}{3}\%$?

6. Knowing 50% of a number, how can you find the number?

7. How can you find a number if you know 25% of it? $33\frac{1}{3}\%$ of it?

8. What part of a dollar is 50¢? 25¢? $33\frac{1}{3}$¢? 75¢? $66\frac{2}{3}$¢?

9. In what two ways may one tenth be written? one hundredth? six tenths? twenty-three hundredths?

10. In adding and subtracting decimal fractions, how should the decimal points be placed? Where is the decimal point placed in the result?

11. How may tenths be changed to hundredths?

12. When tenths are multiplied by an integer, how many decimal places are there in the product?

13. When hundredths are multiplied by an integer, how many decimal places are there in the product?

14. When tenths or hundredths are divided by an integer, where is the decimal point placed in the quotient?

ORAL EXERCISES

1. 8 is $\frac{1}{2}$ of what number? $\frac{1}{4}$ of what number? $\frac{1}{6}$ of what number? $\frac{1}{7}$ of what number?

2. What is the fractional value of 50%? of $33\frac{1}{3}\%$? of 25%? of $66\frac{2}{3}\%$? of 75%?

3. What per cent of an apple is $\frac{1}{3}$ of it? $\frac{1}{2}$ of it? $\frac{1}{4}$ of it? $\frac{2}{3}$ of it? $\frac{3}{4}$ of it? all of it?

4. Find 50% of 10, 30, 14, 18, 40, 100, 600.

5. Find $33\frac{1}{3}\%$ of 3, 21, 15, 90, 300, 36, 1.

6. Find 25% of 4, 20, 32, 16, 100, 120, 800, 6.

7. Find $66\frac{2}{3}\%$ of 12, 3, 25, 30, 60, 33, 27, 150.

8. Find 75% of 8, 24, 36, 100, 28, 400, 1.

9. 20 = 50% of —? 12 is 25% of —? 8 is $33\frac{1}{3}\%$ of —? 16 = 100% of —?

10. Add.

.5	.8	.6	1.3
.2	.6	.4	2.5

11. Subtract.

.9	.4	5.6	3.2
.3	.4	2.1	2.8

12. Add and then subtract.

.21	.16	.23	.4
.14	.08	.17	.35

13. Multiply.

.2	7	.09	.21
4	.8	5	4

DRILL EXAMPLES

1. 78 is $\frac{1}{4}$ of what number? $\frac{1}{3}$ of what number?

2. 86 is $\frac{1}{2}$ of what number? $\frac{1}{5}$ of what number?

3. Find 50% of 98; $33\frac{1}{3}$% of 135; 25% of 176; $66\frac{2}{3}$% of 162; 75% of 228; 100% of 725.

4. 95 = 25% of —? 115 = $33\frac{1}{3}$% of —? 279 = 50% of —? 246 = 75% of —?

5. How much is 50% of 96? $33\frac{1}{3}$%? 25%? $66\frac{2}{3}$%? 75%? 100%?

6. 25% of 36 = $33\frac{1}{3}$% of —? $33\frac{1}{3}$% of 48 = 50% of —? $66\frac{2}{3}$% of 78 = 25% of — ?

Tell the cost of these articles.

7. 130 at 50¢ **9.** 384 at 25¢ **11.** 104 at \$.75

8. 165 at $33\frac{1}{3}$¢ **10.** 117 at \$.66$\frac{2}{3}$ **12.** 147 at $66\frac{2}{3}$¢

Arrange the following numbers properly and add.

13. 15, 8.05, 42.6, 4.93, 12, 7.01, 2.8.

14. 79.8, 14.37, 51.94, 16.07, 85, 26.9, 15.7.

Subtract.

15. 24.19	**16.** 38.24	**17.** 75.7	**18.** 450.
13.87	21.76	48.33	237.16

Find the following products.

19. 6.4	**20.** 9.5	**21.** 28.2	**22.** 236
7	6	54	.8

23. 7×19.82	**24.** 14×8.23	**25.** 48×14.75
26. 58.1÷7	**27.** 60.8÷8	**28.** 130.5÷15
29. 31.62÷6	**30.** 111.45÷15	**31.** 117.6÷16
32. 32.72÷8	**33.** 100.32÷12	**34.** 324.1÷35

GENERAL PROBLEMS

1. Five of Miss Reid's pupils bring their dinners to school. This is $\frac{1}{8}$ of her pupils. How many pupils has she?

2. A boy who had 20¢ spent 50% of his money. How much did he spend?

3. Dorothy had 12 lemon drops. She ate $33\frac{1}{3}\%$ of them and gave the rest away. How many did she give away?

4. Alice and Mildred played 9 games of dominoes and Alice won $66\frac{2}{3}\%$ of the games. How many games did she win?

5. There are 16 houses on Randolph Street. Richard Snow's father built 75% of them. How many houses did Mr. Snow build on that street?

6. Miss Billings has 42 pupils in her room. The attendance today is 100%. How many pupils are present?

7. Martha has six red hens. This is 25% of all the hens she has. How many hens has she?

8. Ned has 30 foreign stamps. This is 50% of the number of stamps in his collection. How many stamps has he in his collection?

9. It is nine miles to Uncle Howard's house. This is $33\frac{1}{3}\%$ of the distance to Uncle Frank's house. How far is it to Uncle Frank's?

10. What is the cost of 12 yards of cloth at 50¢ a yard? at 25¢ a yard? at $33\frac{1}{3}$¢ a yard?

11. What is the cost of eight knives at 75¢ apiece?

12. How much will nine yards of oilcloth cost at $66\frac{2}{3}$¢ a yard?

13. James has hoed 57 hills of potatoes. This is one fifth the number of hills in his garden. How many hills of potatoes are there?

14. At a fire drill 98 children passed out the south door. This was one fourth the number present that day. How many children were present?

15. The pupils of Miss Perkins' room are trying to earn $52 to buy pictures for their room. They already have earned 75% of the amount. How much have they still to earn?

16. Charlotte is reading an interesting book which has 132 pages. She has read $66\frac{2}{3}\%$ of the book. How many pages has she still to read?

17. Anna had 60¢. She spent 25% of it for some pencils and $33\frac{1}{3}\%$ of it for a magazine. How much money has she left?

18. James has a collection of 108 minerals. 50% of them he found himself and $33\frac{1}{3}\%$ of them were given to him. The rest he bought. How many minerals did he buy?

19. Miss Peterson, the sewing teacher, has 104 girls in her fifth-grade classes. 75% of them are making aprons this term and the others are making dusters. How many girls are making dusters?

20. How much was received from the sale of 174 tickets at 50¢ apiece?

21. How much is 540 lb. of cheese worth at 25¢ a pound?

22. How much is 174 yd. of cloth worth at $66\frac{2}{3}$¢ a yard?

23. What is the cost of 200 gal. of oil at 75¢ a gallon?

IMPROVEMENT TESTS

These exercises are given so that you can test yourself on the work of Grade V. The rating of each question is indicated. Try to secure 100 points in each group and a total of 400 points for the exercise.

I. Addition

1. (4)
43
25
56

2. (6)
17
34
26
8
43
15
32
19
6

3. (5)
$1.62
3.75
5.48

4. (8)
462
308
517
645
396
528
134
457
872

5. (5)
$\frac{3}{10}$
$\frac{1}{10}$

6. (6)
$\frac{7}{8}$
$\frac{3}{8}$

7. (5)
$4\frac{1}{2}$
$3\frac{1}{2}$

8. (5)
$\frac{1}{6}$
$\frac{3}{4}$

9. (5)
$\frac{5}{9}$
$\frac{2}{3}$

10. (6)
$5\frac{5}{6}$
$4\frac{1}{4}$

11. (5)
17.6
2.15
9.8
25.32

12. (5)
.46
.31
.28
.55

13. (6)
$15\frac{2}{3}$
$16\frac{1}{2}$

14. (6)
$21\frac{5}{12}$
$18\frac{3}{4}$

15. (6)
6.25+15.4

16. (7)
3.24+7+9.46

17. (10)
$7\frac{1}{3}+15\frac{5}{6}+9\frac{1}{4}$

II. Subtraction

1. (2)
94
58

2. (2)
70
45

3. (4)
426
175

4. (4)
$6.20
2.83

5. (4)
$\frac{7}{12}$
$\frac{5}{12}$

6. (5)
$\frac{5}{8}$
$\frac{1}{4}$

7. (4)
$8\frac{2}{3}$
3

8. (4)
$7\frac{4}{5}$
$2\frac{1}{5}$

9. (4)
$8\frac{5}{6}$
$3\frac{1}{6}$

10. (5)
9
$2\frac{1}{2}$

11. (5)
$143.28
75.62

12. (6)
7,000
5,178

13. (7)
$9\frac{1}{4}$
$6\frac{3}{4}$

14. (8)
$7\frac{1}{3}$
$4\frac{1}{2}$

15. (8)
$15\frac{1}{2}$
$6\frac{5}{8}$

16. $19\frac{3}{4}-10\frac{5}{6}$ (9)

17. $51.2-18.65$ (9)

18. $80-14.26$ (10)

III. Multiplication

1. 46 (3) 7

2. 80 (2) 5

3. 58 (3) 60

4. 436 (4) 504

5. \$6.25 (6) 146

6. 9.2 (4) 2.5

7. 7.86 (5) 37

8. 14.8 (6) 4.7

9. $\frac{2}{3}$ of 24 (4)

10. $\frac{5}{6}\times 21$ (6)

11. 75% of 48 (4)

12. $\frac{5}{6}\times\frac{3}{4}$ (5)

13. $12\frac{1}{3}$ (6) 6

14. $\frac{3}{5}\times 2\frac{1}{2}$ (6)

15. $14\frac{3}{4}$ (8) 5

16. $2\frac{2}{3}\times\frac{9}{10}$ (6)

17. 25 (6) $3\frac{2}{5}$

18. $3\frac{1}{3}\times 4\frac{1}{5}$ (8)

19. 16 (8) $7\frac{2}{3}$

IV. Division

1. $8\overline{)488}$ (2)

2. $5\overline{)\$7.25}$ (3)

3. $7\overline{)4,361}$ (5)

4. $62\overline{)2,666}$ (6)

5. $35\overline{)7,105}$ (7)

6. $73\overline{)30,660}$ (8)

7. $54\overline{)2,079}$ (8)

8. $264\overline{)14,784}$ (8)

9. $144\overline{)86,880}$ (10)

10. $15\div\frac{3}{5}$ (6)

11. $\frac{8}{9}\div\frac{2}{3}$ (7)

12. $\frac{9}{10}\div 6$ (7)

13. $3\frac{3}{4}\div 2\frac{1}{2}$ (8)

14. $51.2\div 8$ (7)

15. $127.62\div 18$ (8)

CHAPTER VII

REVIEW OF FIFTH-GRADE WORK

KEEPING A CASH ACCOUNT

A cash account is a statement of receipts and expenses. It is generally kept on two opposite pages. On the left page are written the cash on hand and also all money received. On the right page are written all the expenditures.

A cash account is usually balanced at the end of each month. The balance is the difference between the sum of the expenses and the sum of the cash on hand and receipts. The balance is written on the right page just below the last expense. The sum of the cash on hand and the receipts just equals the sum of the expenses and the balance.

In starting a new month, the balance from the previous month is entered as the first item on the left page. It is called the "amount brought forward."

Here is a copy of Oscar Reynolds' account for one month.

1923		Received			1923		Paid		
Sept.	1	Cash on hand	$4	62	Sept	5	Entertainment	$	25
	8	Mowing lawns	1	50		10	Eraser		05
	12	Helping Mr. Cox		50		14	Book		75
	15	Errands		25		20	Cap	1	00
	22	Cleaning a cellar		75		24	Present to mother	1	25
	29	Care of garden	1	00			*Balance*	5	32
			8	62				8	62
Oct.	1	Amt. brought forward	5	32					

The same method was used in keeping Oscar Reynolds' cash account for October. Then at the end of October the account was balanced again, and the balance was carried to the November account as the "amount brought forward."

Why is keeping a cash account a good practice?

Rule some paper as shown in the account on page 161 and make out the following cash accounts:

1. Lucy's cash account for October: Oct., cash on hand, $1.85; Oct. 11, received for wheeling a baby, $.25; Oct. 18, paid for paper dolls, $.15; Oct. 24, paid for color book, $.20; Oct. 29, received for helping father, $.25.

2. Margaret's cash account for October: Oct. 1, cash on hand, $2.90; Oct. 5, received weekly allowance, $.25; Oct. 9, paid for song, $.15; Oct. 12, received allowance, $.25; Oct. 17, received for selling postcards, $.60; Oct. 19, allowance, $.25; Oct. 23, paid for book, $.95; Oct. 26, allowance, $.25; Oct. 30, bought scratch pad, $.10.

William Robinson started keeping a cash account on August 1. Here are statements of his receipts and expenditures for August, September, and October.

Aug. 1, cash on hand, $7.15; Aug. 7, received for mowing lawn, $.50; Aug. 10, paid for knife, $.65; Aug. 18, received for birthday present, $2; Aug. 18, paid for hair cut, $.35; Aug. 21, received for cleaning cellar, $.35; Aug. 24, paid for magazine, $.25; Aug. 27, paid for ice cream, $.10; Aug. 28, received for work in store, $1.

Sept. 7, paid for book strap, $.40; Sept. 11, received for mowing lawn, $.50; Sept. 15, paid for concert, $.25; Sept.

18, received for delivering packages, $.75; Sept. 25, received for running errands, $.45; Sept. 29, paid for camera, $2.46.

Oct. 4, received for helping Uncle James, $1; Oct. 11, paid car fares, $.14; Oct. 17, received for raking yard, $.75; Oct. 20, paid for bicycle lock, $.70; Oct. 25, received for picking apples, $1.50; Oct. 30, paid for flash-light, $.75.

1. Make out William's cash account in the form used for Oscar Reynolds' account on page 161. Balance the account for each month.

2. Make a statement of all William's receipts and expenditures for August, September, and October. How does this balance compare with the balance for the October account?

3. Starting with $5.30 on hand September 1, make out a month's cash account for a boy or a girl.

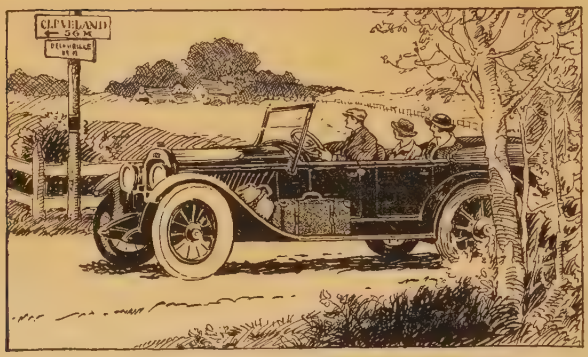
An Automobile Trip

One week-end Mary Reynolds went with her mother and father on an automobile trip to Cleveland and back. It is 144 miles from Mary's home to Cleveland.

1. Before starting Mr. Reynolds bought five gallons of gasoline at 27¢ a gallon, paying for it with a five-dollar bill. How much change did he receive?

2. By noon Mr. Reynolds had driven $76\frac{1}{2}$ miles. How far must they drive in the afternoon in order to reach Cleveland before night?

3. For lunch they bought six sandwiches at 10¢ each, a half-dozen bananas at 30¢ a dozen, and three bottles of



milk at 12¢ a bottle. How much did the lunch cost if they got back 5¢ on each of the milk bottles which they returned?

4. Mr. Reynolds stopped in a city and Mary bought six postcards at 3 for 5¢, and one-cent stamps for all the cards. She gave the clerk a quarter. How much change did she receive?

5. Early in the afternoon they saw a sign, "Cleveland 56 miles." How far had they driven then?

6. On the trip home Mr. Reynolds bought a tire for $17.50, giving the man two ten-dollar bills in payment. How much change did he receive?

7. While in Cleveland on Saturday and Sunday, Mr. Reynolds drove 28 miles about the city. Counting this in, what was their total mileage on the trip?

8. Mr. Reynolds used 16 gal. of gasoline for the trip. How many miles did he average per gallon?

9. The speedometer read "1498 miles" when they started from home. What was the reading when they returned?

REVIEW OF THE FUNDAMENTAL OPERATIONS

ADDITION. Check results.

1.	2.	3.	4.
715	827	7,587	$538.16
206	416	23,192	119.38
138	574	426	56.04
440	269	9,034	273.90
782	843	46,722	158.26
341	505	8,848	395.49
486	923	55,205	654.28
273	511		
195	326		
662	518		

5. Find the sum of $91.71, $482.05, $156.43, $28.84, $842.46, $716.22, $9.03.

6. An exposition was open for a week with the following attendance: Monday, 21,318; Tuesday, 18,462; Wednesday, 17,093; Thursday, 18,806; Friday, 19,951; Saturday, 25,197. What was the total attendance?

7. This table gives the number of boys and girls in each of the ten rooms of the Pilgrim School. Make a copy of the table and fill in all the blank spaces. How can you prove your work from your results?

Room	1	2	3	4	5	6	7	8	9	10	Totals
Boys	22	18	20	19	17	18	23	19	17	18	——
Girls	20	23	18	21	22	18	18	20	24	21	——
Totals	—	—	—	—	—	—	—	—	—	—	——

Addition Time Tests

Test *A*. Time Limit, 6 Minutes

1.	2.	3.	4.	5.	6.
320	406	180	765	154	842
156	393	215	362	378	266
847	241	173	173	225	105
465	817	368	618	614	983
932	165	456	451	288	352
807	350	112	827	316	668
118	638	871	315	751	433
263	254	206	484	127	876
657	331	520	168	518	957

Pupils who are unable to complete Test *A* within the time limit should first find and correct their mistakes and then work the examples in Practice Set *A* to prepare for Test *B*.

Practice Set *A*

1.	2.	3.	4.	5.	6.
476	570	875	617	859	725
527	605	356	785	649	446
314	316	470	312	375	683
862	287	878	960	288	959
125	518	123	825	146	217
671	794	519	778	567	675
518	215	687	537	234	153
430	567	314	465	186	508
764	948	476	623	755	361

Test *B*. Time Limit, 6 Minutes

1.	2.	3.	4.	5.	6.
560	327	428	983	726	506
431	654	376	403	378	892
245	786	847	876	415	437
732	115	278	434	826	608
687	827	123	284	789	751
554	406	749	573	432	385
343	795	422	790	906	969
819	253	578	458	365	124
795	689	346	271	148	893

SUBTRACTION. Check results.

1. 5,682 1,596	**3.** 5,002 2,678	**5.** 17,623 8,746	**7.** $670.05 493.08
2. $62.87 45.38	**4.** $85.40 37.58	**6.** 8,000 4,277	**8.** 621,385 332,976

9. During the first six months of the year a storekeeper took in the following amounts: $586.50, $621.75, $658.23, $598.18, $608.95, $632.09. His expenses for the half year were $1,951.65. How much did he make that half year?

10. Copy this example, and answer the questions.

$$\begin{array}{r} \$\ 95.25 - \$\ 67.18 = -? \\ 141.18 - \quad 82.75 = -? \\ 326.07 - \quad 157.30 = -? \\ 409.51 - \quad 375.82 = -? \\ 216.25 - \quad 168.36 = -? \\ \hline ? \quad - \quad ? \quad = -? \end{array}$$

Subtraction Time Tests

Test *A*. Time limit, 3 minutes

1. 32,640	**2.** 41,264	**3.** 50,423	**4.** 62,307
13,817	22,371	23,185	42,564

5. 735,263	**6.** 406,121	**7.** 540,203
352,617	181,473	154,071

Pupils who are unable to complete Test *A* within the time limit should first find and correct their mistakes and then work Practice Set *A* to prepare for Test *B*.

Practice Set *A*

1. 43,251	**2.** 84,320	**3.** 71,005	**4.** 52,106
27,116	56,057	65,072	41,357

5. 627,454	**6.** 860,255	**7.** 403,218
438,176	263,607	170,629

Test *B*. Time limit, 3 minutes

1. 26,143	**2.** 52,465	**3.** 61,074	**4.** 74,640
18,625	24,397	32,938	48,255

5. 453,670	**6.** 650,223	**7.** 907,062
166,398	251,557	364,198

Making Change

When a store clerk makes change he generally uses the additive method; that is, he finds how much money must be added to the amount purchased to give the money

handed to him. This rapid and accurate method is in very common use. As a rule, change is made with as few coins and bills as possible.

If a customer buys goods to the amount of $2.36 and pays with a $5 bill, the clerk may count change thus: $2.36, $2.40, $2.50, $3.00, $5.00. The change given back would be, 4 cents, 1 dime, 1 half dollar, one $2 bill.

In this exercise imagine you are the clerk and count the change so to use as few coins and bills as possible. Tell what coins and bills you use.

	Amt. of Purchase	Amt. Given		Amt. of Purchase	Amt. Given
1.	$ .35	$ .50	5.	$1.85	$2.00
2.	.80	1.00	6.	4.25	5.00
3.	.45	1.00	7.	1.21	2.00
4.	1.64	2.00	8.	1.35	5.00

Make change for these toys and games bought for Christmas presents.

	Purchase	Amount Given
1.	A color book for 15¢	$ .50
2.	A game of checkers for $.85	1.00
3.	A school box for 70¢	1.00
4.	A picture puzzle for $1.15	2.00
5.	A pair of roller skates for $1.25	2.00
6.	A printing outfit for $2.40	3.00
7.	A doll for $2.20	5.00
8.	A doll carriage for $4.35	5.00
9.	A blackboard for $1.58	2.00
10.	A tricycle for $8.15	10.00

MULTIPLICATION

1. 72×426	4. 461×328	7. $260\times3{,}025$
2. 59×887	5. 619×456	8. $\$51.75\times263$
3. 75×640	6. 405×907	9. $\$75.30\times135$

10. Multiply these numbers by 10; by 100; by 1,000.
16 · 4 · 287 30 45 4,213 · 206

11. A man earned $37.50 a week. How much did he earn in a year?

12. During one season a dealer sold 125 bicycles at $32.50 apiece. What were his total receipts from these sales?

Multiplication Time Tests

Test *A*. Time limit, 5 minutes after copying

1. $6{,}253\times57$	3. $2{,}785\times64$	5. $5{,}748\times93$
2. $3{,}566\times85$	4. $4{,}329\times520$	6. $7{,}804\times138$

Pupils who fail to do Test *A* within the time limit should first find and correct their mistakes and then work the examples in Practice Set *A* to prepare for Test *B*.

Practice Set *A*

1. $6{,}735\times65$	3. $4{,}623\times640$	5. $7{,}609\times457$
2. $3{,}897\times93$	4. $5{,}268\times830$	6. $8{,}950\times265$

Test *B*. Time limit, 5 minutes after copying

1. $7{,}384\times48$	3. $5{,}467\times94$	5. $6{,}483\times830$
2. $4{,}698\times62$	4. $8{,}329\times76$	6. $4{,}608\times254$

Boy Scout Problems

PRICE LIST

Hat	$2.75	Waterproof cape	$6.50
Shirt	2.50	Waterproof hat	1.00
Breeches	3.00	Two-piece army blanket	6.50
Belt	.55	Scout ax	1.50
Stockings	2.65	Scout compass	1.00
Coat	3.50	Wrist watch	5.75
Leggins	1.25	Scout sweater	5.00

1. When James Owen joined Troop 9, he bought a uniform consisting of hat, shirt, breeches, belt, stockings, and coat. What did it cost him?

2. Before James went to camp, Mr. Owen gave him a compass, a wrist watch, and a belt. What was the cost?

3. James' patrol, the Wolf, has eight boys. Find the cost of equipping $\frac{3}{4}$ of the patrol with waterproof capes and hats.

4. James earns $2 a week mowing lawns. He plans to buy a blanket, an ax, a waterproof hat, and a sweater. How many weeks will it take him to earn enough to buy these?

5. Troop 9 has four full patrols of 8 members each. $\frac{1}{4}$ of the boys are Tenderfeet, $\frac{5}{8}$ Second Class, and $\frac{1}{8}$ First Class. How many boys are in each class?

6. Mr. Thomas, James' Scout Master, ordered the following equipment for the troop. What was the total cost?

8 shirts	4 two-piece blankets
6 pair breeches	8 Scout axes
12 pair stockings	6 compasses
4 pair leggins	2 sweaters

7. What would be the cost of furnishing a troop of 24 scouts with all the supplies in the list on page 171?

8. Find the present prices of the articles in the list of Boy Scout supplies and make up four new problems about purchases.

Girl Scout Problems

PRICE LIST

Coat	$4.00	Shirtwaist	$2.50
Skirt	3.50	Neckerchief	.50
Bloomers	3.50	Waterproof poncho	6.00
Middy blouse	2.50	Wrist watch	5.00
Khaki hat	1.75	Pin	.75
Belt	.50	Mess kit	1.75
Stockings	1.00	Scout handbook	.75

1. When Jennie Cary became leader of the Pansy patrol, Troop 12, her mother gave her a new uniform consisting of coat, skirt, bloomers, middy blouse, belt, and stockings. What was the cost?

2. Mary Brown, Troop Scribe, ordered 25 pins for the troop. What did they cost?

3. Jennie's father gave her for birthday presents a wrist watch, a pin, and a belt. What was the total cost?

4. The Pansy patrol ordered the following supplies:

7 coats	8 neckerchiefs
7 skirts	1 poncho
6 bloomers	3 middy blouses

Find the cost.

5. In July Troop 12 ordered 15 handbooks and 25 mess kits. What was the amount of the bill?

6. The Bluebird patrol with 8 girls won 24 merit badges in April, and $\frac{2}{3}$ as many in May. What was the average number won by each girl during the two months?

7. The Pansy patrol won 25% more than the Bluebird. How many did the Pansy patrol win?

8. Find the present prices of the articles in the table of Girl Scout supplies and make up four new problems about purchases.

DIVISION. Check results.

1. $6\overline{)318}$	3. $7\overline{)588}$	5. $9\overline{)324}$	7. $8\overline{)526}$
2. $5\overline{)465}$	4. $6\overline{)468}$	6. $9\overline{)267}$	8. $9\overline{)581}$

1. 4,075 ÷ 25	5. 28,106 ÷ 78	9. \$134,355 ÷ 265
2. 4,788 ÷ 18	6. 33,796 ÷ 238	10. 68,801 ÷ 428
3. 14,755 ÷ 65	7. 81,250 ÷ 325	11. 92,086 ÷ 246
4. 34,254 ÷ 72	8. \$792.75 ÷ 175	12. 90,150 ÷ 375

A Potato Crop

1. On a 16-acre potato field a farmer used 1,256 lb. of fertilizer. How many pounds per acre was this?

2. From this field 4,272 bushels of potatoes were gathered. What was the average number of bushels per acre?

3. For the first 265 bushels he sold, the farmer received \$304.75. How much was this per bushel?

4. For the next 525 bushels, he received \$645.75. What was the average price per bushel for this lot?

Division Time Tests

Test *A*. Time limit, 8 minutes after copying

1. $75\overline{)34,725}$	2. $38\overline{)23,370}$	3. $82\overline{)74,374}$
4. $67\overline{)38,257}$	5. $146\overline{)34,018}$	

Pupils who are unable to finish Test *A* within the time limit should first find and correct their mistakes and then work the examples in Practice Set *A* to prepare for Test *B*.

Practice Set *A*

1. 14,896 ÷ 56
2. 44,384 ÷ 73
3. 27,384 ÷ 84
4. 38,272 ÷ 46
5. 61,335 ÷ 87
6. 40,767 ÷ 127
7. 50,310 ÷ 215
8. 58,328 ÷ 184

Test *B*. Time limit, 8 minutes after copying

1. $47\overline{)25,192}$
2. $65\overline{)32,890}$
3. $76\overline{)48,792}$
4. $91\overline{)52,962}$
5. $228\overline{)97,128}$

PRACTICE WITH LARGE NUMBERS

Read this government report of grain crops.

Crops	Acres	Bushels	Dollars
Rye	5,148,000	79,600,000	50,300,000
Barley . . .	7,550,000	194,000,000	88,500,000
Oats	41,822,000	1,225,000,000	404,100,000
Corn . . .	103,234,000	2,875,000,000	1,801,900,000
Wheat . . .	56,770,000	818,000,000	720,600,000

Add. Check results.

1. 1,685,237 / 4,261,448 / 175,200 / 3,817,619
2. $67,500,000 / 8,426,595 / 53,207,096 / 1,020,987
3. $32,865,420.50 / 7,783,517.95 / 16,150,275.85 / 1,200,562.25

Subtract. Check results.

4. 3,682,145 − 1,279,426
5. $8,270,416 − 4,392,175
6. $625,148.25 − 253,671.75

7. During five successive years the number of tons of cargo carried through the Panama Canal was as follows: 6,574,073; 6,124,990; 8,546,044; 11,415,876; 11,417,459. What was the total number of tons?

8. Below is given the number of immigrants who came to this country in the five years of the World War.

1914	1915	1916	1917	1918
1,218,480	326,700	298,826	295,403	110,618

How many immigrants came during these years?

Read this table giving the area of the earth's land and water, and answer the following questions.

Land	Sq. Mi.	Water	Sq. Mi.
North America	9,431,000	Pacific Ocean	71,000,000
South America	6,856,000	Atlantic "	34,000,000
Europe	3,842,000	Indian "	28,000,000
Asia	17,056,000	Antarctic "	7,500,000
Africa	11,512,000	Arctic "	4,000,000
Australia	3,456,000		
South Polar Lands	254,000		

1. What is the area of North and South America?
2. How does this area compare with that of Asia?
3. Find the total area of all the oceans except the Pacific.
4. How does the Pacific Ocean compare with this total?
5. What is the total area of the land?
6. Compare this with the area of the Pacific Ocean.
7. What is the total area of the water?
8. From your answers to questions five and seven, find the total area of the earth.

1. The area of New York state is 49,204 sq. mi. and the area of Tennessee is 42,022 sq. mi. How much larger is New York than Tennessee?

2. One year Chicago spent $97,291,400 for new buildings and the next year it spent $112,835,150. How much more did it spend the second year than the first?

3. In 1910 the population of Philadelphia was 1,594,008 and in 1920 it was 1,822,158. What was the gain?

Multiply.

1. 9,076 × 483	3. 7,193 × 2,065	5. 85,457 × 764
2. $85.35 × 246	4. $48.36 × 4,600	6. 9,785 × 6,217

7. How many feet are there in 785 miles?

8. Sound travels 1,089 feet per second. How far does it travel in 2 minutes?

9. A factory built 35 cottages at an average cost of $1,986.80 apiece. How much did all the cottages cost?

10. One year a factory sold 1,576 automobiles at $1,295 each. What were the receipts that year?

11. A book containing 525 pages has about 275 words on a page. About how many words are there in the book?

1. 197,736 ÷ 642	6. 466,070 ÷ 627
2. 384,290 ÷ 830	7. 229,679 ÷ 478
3. 2,648,880 ÷ 624	8. 4,254,379 ÷ 545
4. 1,038,464 ÷ 2,432	9. 4,312,000 ÷ 7,000
5. 1,102,500 ÷ 1,500	10. 1,058,048 ÷ 1,536

11. During a season of 252 performances there were 217,476 paid admissions to a theater. What was the average paid attendance each night?

12. One year a factory paid $1,163,880 in wages to 795 workers. How much was the average pay per year for each?

13. The area of Texas is 265,896 sq. mi., and of Delaware is 2,390 sq. mi. How many states the size of Delaware would Texas make and how many sq. mi. would be left?

14. One year a city library was open 305 days and lent 59,475 books. What was the average number lent per day?

15. On a Fourth of July 115 trolley cars carried 39,560 passengers. What was the average number carried by each car that day?

Read this government report about cotton, and answer the following questions.

Year	Crop of U.S. (*500-lb. Bales*)	Average Price to Producer (*Per Lb.*)	Exported Cotton (*Lb.*)	Imported Cotton (*Lb.*)
1917	11,302,375	27.12	3,088,080,786	147,061,635
1918	12,040,532	28.76	2,320,511,655	103,325,647
1919	11,420,763	35.36	3,367,677,985	175,358,368
1920	13,439,603	15.89	3,179,313,336	299,994,378
1921	7,953,641	16.90	3,339,113,489	138,948,612

1. Find the number of pounds in each year's crop.

2. At the given price per pound, find the value of each crop.

3. How many bales were in each year's exports? imports?

4. Find the difference in bales between each year's exports and imports.

Earning Money for a Picture

The children in Miss Snow's room decided to work and earn money for a picture which cost $15.00. They collected waste material which a local dealer bought at these prices:

Old papers 50¢ a hundred pounds Old metals . 5¢ lb.
Rags . . 50¢ a hundred pounds Rubbers . 1¢ lb.
Bottles . . 6¢ doz.

1. Mary Jones had charge of the papers. Her group collected 900 lb. of papers. How much was this worth?

2. Richard Strong's group collected 800 lb. of rags. Find the value of these rags.

3. Clara Martin's group brought in 125 lb. of rubbers. How much were the rubbers worth?

4. Martha Little's group collected 40 dozen bottles. How much were these worth?

5. The last group, headed by Ted Steele, brought in 80 lb. of old metal. Find the value of this metal.

6. What was the total amount obtained? Was it enough to buy the picture?

ROMAN NUMERALS

You have already learned the Roman numerals from I to XII as they are used on the clock face, and also the Roman numerals from I to C as they are used in the numbering of book chapters. Roman numerals are also used in writing dates, especially on buildings. To read and write these dates we need to learn two more numerals used in writing large numbers. They are D = 500 M = 1,000

Here are the values of numerals used in Roman notation.

I=1	V=5	X=10	L=50	C=100	D=500	M=1,000

The following rules will enable you to write ordinary numbers in Roman notation.

1. Repeating a numeral repeats its value.

2. When a smaller numeral follows a larger one, the two values are added.

3. When a smaller numeral comes before a larger one, its value is subtracted from the larger value.

Explain these values, applying the above rules.

XXX=30	IX = 9	LXIV= 64	XLVIII = 48
VII = 7	XL =40	CD =400	DCCXXI= 721
LX =60	XIX=19	DC =600	MCM =1900

Read.

1.	2.	3.	4.
XVI	CX	MDCCC	CDV
XXXV	CCIV	MCMII	MCDXCII
DCC	XLVII	MCMXXIII	MDCXX
XXIX	CLVI	MCMXXV	MDCCLXXVI

PROFIT AND LOSS

When anything is sold for more than it cost, the difference between selling price and cost is called the *profit*, or the *gain*. When anything is sold for less than it cost, the difference between cost and selling price is the *loss*.

As used here, cost means the purchase price and all other expenses of handling the goods.

A. A grocer bought coffee at a cost of 37¢ a lb. and sold it at 50¢ a lb. How much was his profit per lb.?

50¢ selling price
37¢ cost — His profit was 13¢ per lb.
13¢ profit

B. A grocer bought berries at 18¢ a basket and he sold some of them Saturday night at 15¢ a basket. How much did he lose on each basket? on 50 baskets?

\$.18 cost of each basket	\$.03
.15 selling price	50
\$.03 loss on each basket	\$1.50 total loss on 50 baskets

PROBLEMS

1. A dealer bought apples at a cost of \$3.45 a barrel and sold them for \$4.25 a barrel. How much did he gain (or make) on each barrel? on 80 barrels?

2. A man bought a lot for \$1,800 and built a house on it for \$5,400. He sold the house and lot for \$8,000. What was his profit?

3. Edward bought 50 boxes of silver polish at 18¢ a box and sold it at 25¢ a box. How much did he make?

4. For an entertainment some girls bought 75 pounds of candy at 35¢ a pound and they sold it in small bags at the rate of 60¢ a pound. How much did they make?

5. A man bought a farm for $3,500 and spent $800 for repairs. He sold the farm for $3,800. How much did he lose?

6. A dealer bought 90 pairs of shoes for $427.50. He sold them for $5.95 a pair. What was his profit?

7. Walter Johnson bought 50 chocolate bars at 7¢ each and he sold them for 10¢ each. What was his profit?

8. A grocer had 500 lb. of sugar on hand which cost him 8¢ a pound. On account of a drop in price he had to sell it at $5\frac{1}{2}$¢ a pound. What was his loss?

9. Rolls of cloth containing 50 yd. cost $42.50 a roll. This cloth was retailed at $1.10 a yard. What was the profit on each roll? on 12 rolls?

10. Robert Jones gets a weekly magazine at 3¢ a copy and sells it at 5¢ a copy. He has 58 customers. How much does he make each week?

11. A troop of Girl Scouts gave a play. It cost them $4.50 for printing and $3.75 for costumes. They took in $32.50. How much did they make on the entertainment?

12. A real-estate dealer bought a plot of land for $5,000 and cut it up into 12 building lots. If he spent $1,500 in laying out the plots and $400 in advertising, how much did he make by selling the 12 lots at $875 each?

13. A grocer bought 25 lb. of tea for $10.50 and sold it at a special sale for 45¢ a pound. Did he gain or lose, and how much?

GENERAL TESTS

I

1. $\begin{array}{r} 7{,}050 \\ -\ 3{,}146 \\ \hline \end{array}$

2. 28×16.45

3. $\frac{3}{4} \times \frac{8}{15} \times \frac{5}{6}$

4. Find $66\frac{2}{3}\%$ of 36.

5. For a \$2.69 purchase a \$5 bill was given. Make change with as few coins and bills as possible.

6. Fifty pounds of coffee, bought at 38¢ a pound, was sold at 45¢ a pound. How much was the grocer's profit?

7. Shoes costing \$4.10 a pair were sold for \$3.75 a pair. How much was the loss on 65 pairs?

II

1. 50% of 86 is 25% of ——?

2. $\begin{array}{r} 73\frac{1}{8} \\ -\ 32\frac{3}{4} \\ \hline \end{array}$

3. Divide 41.92 by 8.

4. $\frac{6}{25} \times 1\frac{7}{8}$

5. Find the cost of two dozen neckties at $66\frac{2}{3}$¢ each.

6. At $5\frac{1}{2}$¢ a square foot what will be the cost of ceiling board for a room 12 feet by 15 feet?

III

1. 75 is $\frac{1}{9}$ of what number?

2. Add 37.8 and 46.2 and then find 75% of the sum.

3. $16\frac{1}{5} + 20\frac{1}{2} + 14\frac{3}{10} + 9\frac{3}{4}$

4. A purchase of \$5.19 was paid for with a \$10 bill. Make change with as few coins and bills as possible.

5. A man pays \$35 a month rent. How much rent does he pay in five years?

6. Write: five billion twenty million six thousand fifteen.

IV

1. Write 1924 in Roman numerals.

2. From 61.2 take 34.7.

3. Divide \$28,221.90 by 623.

4. A public market bought 250 bushels of potatoes at a cost of \$1.10 a bushel and sold them at 35¢ a peck. How much did the market make on the potatoes?

5. Take 25% of 172 from $66\frac{2}{3}\%$ of 108.

6. Make out the following cash account for Ralph Weston, showing the balance to carry forward to October:

Sept. 1, cash on hand, \$4.06; Sept. 5, paid for school box, \$.25; Sept. 7, received for mowing lawn, \$.75; Sept. 9, paid for baseball, \$.65; Sept. 15, received for running errands, \$.50; Sept. 25, ticket to entertainment, \$.35; ice cream and cake, \$.30.

V

1.
\$615.28
543.65
17.90
201.36
675.19
86.50
132.75

2. \$500.20 − \$195.75

3. $4\frac{3}{4} + 6\frac{1}{2} - 3\frac{5}{8}$

4. $\frac{24 \times 10 \times 27}{15 \times 18 \times 8}$

5. What is the profit on 5 doz. padlocks bought for \$4.20 a dozen and sold at 50¢ each?

6. Find 75% of the sum of 65.7 and 26.3.

CHAPTER VIII

BILLS AND RECEIPTS; PRACTICE WITH FRACTIONS

BILLS AND RECEIPTS

A *bill* is a statement of goods sold or of services rendered.

If goods are not paid for when they are purchased, a bill is generally sent on the first day of the following month. This bill gives the names of the dealer and the purchaser and it shows the date of each purchase, the quantity bought, the cost of each item, and the total amount of the bill.

Here is a monthly statement or bill of a dry goods store.

FORBES & WALLACE

SPRINGFIELD, MASS.

March 1, 1923

Sold to Mrs. William H. Stebbins,
532 Princeton St.

Feb. 12	2 pr. blankets	$6.50	13	00		
" 20	1 school dress		4	98		
" 23	5 yd. lace	.42	2	10		
" 27	6 handkerchiefs	.39	2	34		
	1 boy's hat		1	25		
	1 tablecloth		1	49	25	16

This is a receipted bill.

SCRANTON, PA., Aug. 1, 1923

MR. JAMES L. BOWEN,
62 Brown St.,

BOUGHT OF JOHN L. STODDARD & CO.
Dealers in Hardware
432 Charles St.

July 11	2 screw drivers	$ .80	1	60		
	15 lb. wire nails	.10	1	50		
20	1 pr. pliers			70		
	3 padlocks	.85	2	55		
27	2 screen doors	3.75	7	50	13	85
	Received Payment Aug. 7, 1923 John L. Stoddard & Co. Per J. M. R.					

When the above bill was paid on Aug. 7, 1923, the clerk who received the money receipted the bill for the firm, writing the date of the payment and placing his initials under the name of the firm.

Rule paper like the above form and make out and receipt the following bills. Consider the goods bought in the present year, and in receipting sign the firm name with your own initials.

1. Arthur L. Taylor bought of the Atwood Hardware Co., 816 Broad St., Cleveland, Ohio: May 3, 2 hoes at $1.15; May 18, 1 scythe at $2.00; 5 lb. staples at $.22; May 25, 1 shovel at $1.85.

2. Jones and Carter bought of R. S. Phillips & Co., 862 Center St., St. Louis, Mo.: June 5, 4 gal. paint at $5.25; 1 gal. varnish at $4.75; June 8, 2 gal. oil at $1.65; 3 gal. turpentine at $1.35.

3. Henry R. Brown bought of Long and Peterson: June 18, 1 scout ax, $2.00; 1 bathing suit, $3.50; June 21, 1 flashlight, $1.25; 2 batteries, $.45; 1 camera, $5.50; June 25, tennis racket, $5.75.

4. Albert K. Morrison bought of Spaulding and Carpenter: Oct. 15, 3 lb. sausage at $.40; 2 lb. prunes at $.25; 1 lb. tea at $.60; Oct. 20, 2 doz. lemons at $.45; 1 bottle catsup at $.30; 2 doz. bananas at $.35.

5. Mrs. Robert W. Wood bought of R. H. Summer & Co.: Nov. 2, 2 pr. silk gloves at $1.75; 4 yd. ribbon at $.65; Nov. 10, 2 yd. satin at $3.50; Nov. 15, 6 handkerchiefs at $.25; Nov. 20, 1 pr. blankets at $4.79; Nov. 27, 1 pair shoes at $6.25.

Make out bills for the following lists of goods, filling in the names of the dealer, the purchaser, and the date. Use the names of appropriate firms near your own home. Date and receipt each bill.

1.	3 qt. beans	@ $.09	2.	2 doz. buttons	@ $.15
	4 loaves bread	@ .12		1 tube toothpaste	@ .19
	2 lb. raisins	@ .35		3 packages pins	@ .11
	3 qt. milk	@ .14		10 bars soap	@ .09
	2 boxes berries	@ .30		8 yd. wash goods	@ .35
	1 lb. cookies	@ .28		2 aprons	@ .83

The symbol @ means *at*.

3.	10 yd. matting	@ $.49	**4.**	6 lb. coffee	@ $.45
	$6\frac{1}{2}$ yd. gingham	@ .25		2 lb. nuts	@ .35
	5 yd. muslin	@ .39		1 can salmon	@ .30
	10 pillow cases	@ .59		2 doz. eggs	@ .40
	$8\frac{1}{2}$ yd. toweling	@ .56		5 lb. sugar	@ .07
	6 yd. ribbon	@ .35		$2\frac{1}{4}$ lb. cheese	@ .35

Buying Toys

PRICE LIST

Baseball	$ .75	Jump rope	$ .35
Bat	.65	Hoop	.50
Catcher's mitt	1.75	Set of dishes	2.25
Air rifle	1.50	Tennis racket	3.50
Football	2.00	Tennis ball	.50
Tool box	2.75	Croquet set	2.50
Printing press	3.25	Roller skates	3.00
Basket ball	4.25	Blackboard	2.25

Consider yourself the buyer and make out and receipt bills from different firms for the following articles.

1. 3 baseballs, 1 bat, 1 catcher's mitt, 6 tennis balls.

2. 8 jump ropes, 2 croquet sets, 4 pairs of roller skates, 12 hoops.

3. 2 air rifles, 3 tool boxes, 6 basket balls, 2 tennis rackets.

4. 2 tool boxes, 2 blackboards, 4 printing presses, 3 air rifles.

5. 3 footballs, 12 baseballs, 2 croquet sets, 1 pair roller skates.

6. 2 blackboards, 4 sets of dishes, 2 jump ropes, 3 croquet sets, 6 pairs roller skates.

RECEIPTS

In place of a receipted bill, sometimes a simple receipt like the following is made out.

Chicago, Ill., Oct. 19, 1922.

Received of Arthur T. Raymond
Twelve $\frac{25}{100}$ ---------- Dollars
for repairing piazza

$12.25 Albert R. Simons

Regular printed receipt forms like the above, with blank spaces to be filled in, can be purchased in any town.

1. On Dec. 3, John M. Roberts received from Richard S. Walters $40 for house rent to Dec. 1. Make out a receipt.

2. On May 15, Robert T. Jones received from William M. Cooke, $27.50 for moving furniture. Make out a receipt.

3. Make out a receipt showing that Dr. Charles J. Francis received $30 from Alfred N. Stevens for professional services.

4. Write a receipt for $8 paid to you by Ralph S. Peters.

5. Write a receipt for $1.50 paid by Charles M. Green to Fred L. Janes for a toy airplane.

6. Grace L. Johnson received from Mrs. James L. Carter $2.50 for a magazine subscription. Write a receipt.

7. Write a receipt for $175.50 paid by Stanley Richards to Walter Smith for painting house.

TESTS FOR DIVISIBILITY

These rules of divisibility will be found useful:

A number is divisible by 2 when its last figure is 0 or is divisible by 2.

A number is divisible by 5 when its last figure is 0 or 5.

A number is divisible by 3 when the sum of its figures is divisible by 3.

324 is divisible by 3 as the sum of its figures is 9, which is divisible by 3.

(Without pencil)

1. Which of these numbers are divisible by 2?

12 27 29 36 64 43 58 76 61

2. Which of these numbers are divisible by 5?

15 22 30 47 45 21 39 40 95

3. Which of these numbers are divisible by 3?

23 15 18 37 36 49 87 123 326

4. Which of these numbers are divisible by 2? by 3? by 5?

(*a*)	(*b*)	(*c*)	(*d*)	(*e*)
12	51	55	384	126
18	70	57	270	115
35	45	75	405	330

5. Reduce these fractions to their lowest terms.

$\frac{14}{21}$ $\frac{9}{18}$ $\frac{10}{12}$ $\frac{16}{24}$ $\frac{12}{30}$

6. Change these fractions to twenty-fourths.

$\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{6}$ $\frac{7}{12}$

7. Change these improper fractions to mixed numbers.

$\frac{7}{4}$ $\frac{9}{5}$ $\frac{13}{8}$ $\frac{25}{6}$ $\frac{47}{9}$

8. $\frac{5}{9} + \frac{3}{9}$ $\frac{5}{16} + \frac{3}{16}$ $\frac{2}{3} + \frac{1}{6}$ $\frac{5}{6} + \frac{1}{4}$

9. $\frac{11}{15} - \frac{4}{15}$ $\frac{13}{18} - \frac{7}{18}$ $\frac{2}{3} - \frac{5}{9}$ $\frac{3}{4} - \frac{1}{8}$

10. Change to improper fractions.

$5\frac{1}{2}$ $4\frac{2}{3}$ $1\frac{7}{12}$ $2\frac{5}{8}$ $3\frac{4}{9}$ $2\frac{5}{6}$ $4\frac{2}{5}$ $7\frac{3}{10}$

11. $2 \times \frac{5}{12}$ 12. $13 \times \frac{1}{9}$ 13. $\frac{3}{4} \times \frac{4}{9}$ 14. $\frac{2}{9}$ of 18

15. $2 \div \frac{1}{5}$ 16. $\frac{3}{4} \div \frac{1}{4}$ 17. $\frac{2}{3} \div \frac{1}{6}$ 18. $5 \div \frac{1}{3}$

DRILL EXAMPLES

1. Reduce the following to their lowest terms.

$\frac{56}{70}$ $\frac{45}{63}$ $\frac{48}{54}$ $\frac{48}{72}$ $\frac{63}{81}$

2. $\frac{5}{6} + \frac{3}{4}$

3. $\frac{2}{3} + \frac{5}{8}$

4. $\frac{5}{6} + \frac{4}{9}$

5. $\frac{2}{3} + \frac{4}{9} + \frac{5}{6}$

6. $\frac{5}{16} + \frac{3}{8} + \frac{7}{12}$

7. $15\frac{2}{3} + 8\frac{1}{4} + 29\frac{1}{6} + 7\frac{1}{2}$

8. $\frac{5}{8} - \frac{1}{6}$ $\frac{5}{6} - \frac{2}{9}$

9. $\frac{11}{12} - \frac{5}{8}$ $\frac{5}{6} - \frac{4}{15}$

10. $\frac{1}{2} + \frac{1}{4} - \frac{1}{8}$

11. $\frac{7}{8} + \frac{1}{6} - \frac{3}{4}$

Subtract.

12. $42\frac{3}{4}$ — 20

13. 35 — $16\frac{7}{8}$

14. $431\frac{5}{8}$ — $168\frac{7}{12}$

15. $572\frac{5}{6}$ — $486\frac{8}{9}$

16. Find the number of which 35 is $\frac{1}{6}$; of which 275 is $\frac{1}{4}$.

1. $\frac{7}{8}$ of 128
2. $\frac{8}{15}$ of 70
3. $\frac{9}{16}$ of 176
4. $6 \times 5\frac{3}{4}$
5. $\frac{5}{16} \times \frac{14}{25}$
6. $\frac{7}{8}$ of $2\frac{2}{15}$
7. $2\frac{8}{15} \times 6\frac{3}{4}$
8. $\frac{9}{14} \times 5\frac{5}{6}$
9. $3\frac{3}{5} \times 6\frac{1}{4}$
10. $12 \div \frac{6}{7}$
11. $\frac{14}{15} \div \frac{3}{5}$
12. $\frac{3}{8} \div \frac{15}{16}$
13. $8\frac{3}{4} \div \frac{5}{14}$
14. $15 \div 4\frac{1}{2}$
15. $6\frac{3}{4} \div 5\frac{5}{8}$
16. $10\frac{1}{2} \div 14$
17. $12\frac{1}{4} \div 2\frac{5}{8}$
18. $7\frac{1}{9} \div 13\frac{1}{3}$

PROBLEMS

1. The distance to a camp is $7\frac{3}{8}$ mi. by one road and $8\frac{5}{6}$ by another road. How many miles is the round trip, going one way and coming back the other way?

2. A tank contained $20\frac{1}{4}$ gal. of oil. After $7\frac{5}{8}$ gal. had been drawn from it, how many gallons did it contain?

3. A pile of books was 18 in. high. From it were taken one book $\frac{7}{8}$ in. thick, another $\frac{3}{4}$ in. thick, and a third $1\frac{1}{2}$ in. thick. How high was the pile then?

4. A farmer's apple crop one fall was $25\frac{1}{6}$ bbl. of baldwins, $9\frac{3}{5}$ bbl. of greenings, and $6\frac{1}{2}$ bbl. of sweet apples. How many barrels of apples were in the crop?

5. An automobile which was bought for \$1,200 was sold for $\frac{7}{8}$ of its cost. What was the selling price?

6. At a church supper five tables, each $4\frac{2}{3}$ ft. long, were placed end to end. What was their combined length?

7. Lucy had a piece of cloth $\frac{3}{4}$ yd. long. She used $\frac{8}{9}$ of it for a doll's dress. What part of a yard did she use for the dress?

8. What is the cost of $2\frac{2}{3}$ yd. of cloth at $37\frac{1}{2}$¢ a yard?

9. How many glasses, each holding $\frac{3}{4}$ pt., can be filled from a pitcher that holds $7\frac{1}{2}$ pt.?

10. There were $20\frac{1}{2}$ yd. of cloth in a roll. After a clerk had sold $16\frac{3}{4}$ yd., Mrs. Bailey bought $\frac{2}{5}$ of what was left. How many yards did Mrs. Bailey buy?

11. A cooking apron and cap require $3\frac{1}{4}$ yd. of lawn. How many can be cut from $19\frac{1}{2}$ yd.?

At the Market

PRICE LIST

Lamb, per lb.	$.40	Butter, per lb.	$ .42
Roast beef, per lb.	.38	Eggs, per doz.	.48
Chicken, per lb.	.44	Lemons, per doz.	.35
Bread, per loaf	.12	Salmon, per can	.26
Coffee, per lb.	.42	Flour, per bag	1.85

From the above price list, find the cost of

1. 3 lb. coffee
2. 4 cans salmon
3. $5\frac{1}{2}$ lb. lamb
4. $3\frac{1}{2}$ lb. butter
5. 30 eggs
6. $4\frac{3}{4}$ lb. chicken
7. $8\frac{1}{2}$ doz. lemons
8. 5 bags flour
9. $3\frac{1}{4}$ lb. roast beef
10. $6\frac{3}{4}$ lb. butter

Marketing for Mother

1. Mary went to the market and bought $2\frac{1}{2}$ lb. butter and 2 lb. coffee. What was the cost?

2. Jane bought $2\frac{1}{4}$ lb. butter and a bag of flour. What was the cost?

3. Helen bought 3 cans salmon and $4\frac{1}{2}$ lb. lamb. How much did this amount to?

4. Ruth stopped at the market and ordered $1\frac{1}{2}$ lb. butter, 1 bag of flour, and $2\frac{1}{2}$ doz. lemons. How much was the bill for this?

5. On Saturday morning Priscilla went to the market and ordered: $4\frac{1}{2}$ lb. roast beef, 2 lb. coffee, 2 doz. eggs, $2\frac{1}{2}$ doz. lemons, $\frac{1}{2}$ lb. butter. What was the bill?

FINDING WHAT PART ONE NUMBER IS OF ANOTHER

1. What part of 4 is 2?

2. 3 is what part of 12?

3. Two feet are what part of a yard? Two inches are what part of a foot?

What part of 20 is 15?

1 is $\frac{1}{20}$ of 20. 15 is $\frac{15}{20}$ of 20. $\frac{15}{20} = \frac{3}{4}$. 15 is $\frac{3}{4}$ of 20.

To find what part a smaller number is of a larger, divide the smaller number by the larger and reduce.

1. What part of 24 is 8? of 45 is 9? of 20 is 5?

Find what part the first number is of the second.

2. 6, 8	4. 10, 15	6. 12, 30	8. 15, 40
3. 8, 12	5. 9, 12	7. 15, 18	9. 18, 27

PROBLEMS

1. What part of 24 days are 16 days?

2. Fred has earned \$24 toward a \$40 bicycle. What part of the cost of the bicycle has he earned?

3. Margaret picked 28 roses from her garden and gave 21 of them away. What part of the roses did she give away?

4. On an arithmetic test, 30 of 35 pupils got over 85%. What part of these pupils got over 85%?

5. A man had a farm of 45 acres. He sold 27 acres. What part of the farm did he sell?

6. Twenty-eight feet of a flag pole 36 feet long is above ground. What part of the flag pole is above ground?

KNOWING A PART, TO FIND THE WHOLE

If 6 is $\frac{3}{4}$ of a number, what is the number?
If 6 is $\frac{3}{4}$ of the number, $\frac{1}{4}$ of the number is $\frac{1}{3}$ of 6, or 2.
If 2 is $\frac{1}{4}$ of the number, $\frac{4}{4}$ of the number, or the whole number, is 4×2, or 8.

1. 16 is $\frac{2}{3}$ of what number?
2. 14 is $\frac{7}{8}$ of what number?

Find the number of which

3. 28 is $\frac{2}{3}$.
4. 27 is $\frac{3}{4}$.
5. 45 is $\frac{5}{6}$.
6. 64 is $\frac{4}{5}$.
7. 73 is $\frac{1}{6}$.
8. 125 is $\frac{5}{9}$.
9. 108 is $\frac{9}{10}$.
10. 126 is $\frac{7}{12}$.
11. 104 is $\frac{4}{5}$.

PROBLEMS

(Without pencil)

1. Richard has done six examples. This is $\frac{2}{3}$ of the number he has to do. How many examples has he to do?

2. There were 12 girls at a club meeting. This was $\frac{3}{4}$ of the members. How many girls belong to the club?

3. Jennie sent 16 Christmas cards. This is $\frac{4}{5}$ of the number she received. How many cards did she receive?

4. Lucy's mother put up ten jars of blackberries, which was $\frac{2}{5}$ of the number of jars of peaches she put up. How many jars of peaches did she put up?

5. Twelve boys live on James Street. This is $\frac{6}{7}$ of the number of girls that live on the street. How many girls live on James Street?

(With pencil)

1. In the second grade of a school there are 90 pupils. This is $\frac{5}{6}$ of the number in the first grade. How many pupils are in the first grade?

2. A bank building is 80 feet high. It is $\frac{2}{3}$ as high as the office building next to it. How high is the office building?

3. Last year there were 54 pupils in the sixth grade of the Longfellow School. That is $\frac{3}{4}$ of the number this year. How many sixth-grade pupils are in the school?

4. A tank containing 72 gallons of water is $\frac{4}{5}$ full. How many more gallons can be put into the tank?

COMPARISON

We compare numbers when we find what part one is of the other or how many times it is contained in the other.

We can compare only quantities of the same kind.

This comparison is called the *ratio* of the two quantities. It is found by dividing one of the quantities by the other.

A. Compare 8 inches with 12 inches.

1 inch is $\frac{1}{12}$ of 12 inches.

8 inches is $\frac{8}{12}$ of 12 inches. $\frac{8}{12} = \frac{2}{3}$. 8 inches is $\frac{2}{3}$ of 12 inches.

B. Compare 18 quarts with 12 quarts.

1 quart is $\frac{1}{12}$ of 12 quarts. 18 quarts is $\frac{18}{12}$ of 12 quarts. $\frac{18}{12} = 1\frac{1}{2}$. 18 quarts is $1\frac{1}{2}$ times 12 quarts.

1. Compare 5 yd. with 7 yd.; 6 ft. with 15 ft.

2. Compare 20 bu. with 10 bu.; 8 pk. with 6 pk.

Compare

3. \$3 with \$5.
4. 10 gal. with 15 gal.
5. 6 lb. with 4 lb.
6. 16 pt. with 10 pt.

A. If 6 lb. of onions cost 25¢, how much will 30 lb. cost? 30 lb. is 5×6 lb. The cost of 30 lb. will be $5 \times 25¢$, or \$1.25.

B. At 30¢ a dozen, how much will 18 bananas cost? 18 is $\frac{18}{12}$, or $\frac{3}{2}$ doz. 18 bananas will cost $\frac{3}{2}$ of 30¢, or 45¢.

PROBLEMS

1. If four large baskets of plums can be bought for \$3.00, what will be the price of eight baskets?

2. When two boxes of matches can be bought for 15¢, how much will 10 boxes cost?

3. How much will a dozen cans of washing powder cost, when 3 cans sell for 25¢?

4. What is the price of eight jelly tumblers that sell for 60¢ a dozen?

Find the cost of

5. A dozen apples which sell at 2 for 5¢.
6. Three fruit-jars at \$1.00 a dozen.
7. 9 oranges at 48¢ a dozen.
8. $1\frac{1}{2}$ doz. peaches at 3 for 5¢.
9. 40 bars of soap selling at 10 bars for 75¢.
10. 25 sheets of paper at 80¢ a hundred.
11. 10 doz. screws at 42¢ a gross.

ALIQUOT PARTS, EXTENDED

We already have had practice in working with the following parts of a dollar.

$50¢ = \$\frac{1}{2}$ $25¢ = \$\frac{1}{4}$ $75¢ = \$\frac{3}{4}$ $33\frac{1}{3}¢ = \$\frac{1}{3}$ $66\frac{2}{3}¢ = \$\frac{2}{3}$

From these we get

$\$1.50 = \$1\frac{1}{2} = \$\frac{3}{2}$. $\$2.25 = \$2\frac{1}{4} = \$\frac{9}{4}$. $\$1.75 = \$1\frac{3}{4} = \$\frac{7}{4}$.

Other fractional parts of a dollar are found in this table.

$5¢ = \$\frac{1}{20}$	$20¢ = \$\frac{1}{5}$	$62\frac{1}{2}¢ = \$\frac{5}{8}$
$10¢ = \$\frac{1}{10}$	$37\frac{1}{2}¢ = \$\frac{3}{8}$	$80¢ = \$\frac{4}{5}$
$12\frac{1}{2}¢ = \$\frac{1}{8}$	$40¢ = \$\frac{2}{5}$	$87\frac{1}{2}¢ = \$\frac{7}{8}$
$16\frac{2}{3}¢ = \$\frac{1}{6}$	$60¢ = \$\frac{3}{5}$	$90¢ = \$\frac{9}{10}$

What is the cost of 16 yards of cloth at $37\frac{1}{2}¢$ a yard?

$37\frac{1}{2}¢ = \$\frac{3}{8}$, the cost of 1 yd.

$16 \times \$\frac{3}{8} = \$6$, the cost of 16 yd.

Tell the cost of these things.

1. 20 small balls at 10¢
2. 28 lb. raisins at 25¢
3. 14 scout belts at 50¢
4. 30 lb. beans at $16\frac{2}{3}¢$
5. 15 boxes berries at $33\frac{1}{3}¢$
6. 32 yd. cloth at $37\frac{1}{2}¢$
7. 8 flashlights at 75¢
8. 16 lb. tea at $62\frac{1}{2}¢$
9. 30 books at 60¢
10. 16 yd. cloth at $87\frac{1}{2}¢$
11. 20 baskets of plums at 80¢
12. 8 tennis rackets at $2.25
13. What is the cost of 12 pairs of ice skates at $1.50 a pair?
14. At $1.75 a bag, how much will 16 bags of flour cost?
15. Find the cost of 8 lamps at $3.50 each.

ESTIMATING RESULTS

Many times, before doing a problem, it is possible to estimate what the result will be. In this way absurd answers are quickly recognized and corrected. Estimate results wherever you can in all your work from now on.

A. What is the cost of 7 chairs at \$8.95 apiece?

\$8.95 is nearly \$9.00. Our estimate is nearly $7 \times \$9.00$, or \$63. The cost is a little under \$63. By actual multiplication we get \$62.65.

B. Divide \$33.60 by 8.

$\$33 \div 8$ gives a little over \$4.00. Our estimate, then, is \$4. By actual division we get \$4.20. Copy the following form and fill in the blank spaces.

PROBLEMS

In these problems first estimate the result and then see how near your estimate comes to the actual result.

	Estimate	Actual Result
1. $4 \times \$9.92$		
2. $\frac{3}{4}$ of $8\frac{2}{3}$		
3. $12 \times \$.74$		
4. $\$34.90 \div 5$		
5. $6\frac{1}{8} \times 40$		

6. What is the cost of 9 pairs of shoes at \$5.95 a pair?

7. How much will 20 tons of coal cost at \$14.50 a ton?

8. In eight schoolrooms \$42 worth of Red Cross stamps were sold one morning. What was the average per room?

9. Find the cost of $4\frac{3}{4}$ doz. bananas at 28¢ a dozen.

The Apple Crop

1. Mr. King has a 5-acre apple orchard with 200 trees in it. How many square rods does this allow for each tree?

2. The spring pruning required the work of two men for 150 hours. The first man received 75¢ an hour and the second man 50¢ an hour. What was the cost of the pruning?

3. Mr. King used 15 lb. of fertilizer for each tree. At $50 a ton what was the cost of the fertilizer?

4. For spraying each tree he used 4 gal. of spray. How many gallons were required for the orchard?

5. For each 100 gallons of spray 11 gallons of lime sulphate at 27¢ a gallon were required. What was the total cost of spraying?

6. The crop averaged $2\frac{1}{4}$ barrels to the tree. What was the cost of picking at 40¢ per barrel?

7. Of the whole crop, one-fifth were "fancy apples," two-fifths were "number one's," and two-fifths were "seconds." How many barrels of each kind were there?

8. Counting 11 pecks to the barrel, how many bushels were there of each kind?

9. The "fancy apples" brought $6.00 per barrel, the "number one's" $4.50 per barrel, and the "seconds" $3.50 per barrel. How much did Mr. King receive for his crop?

CHAPTER REVIEWS

DRILL EXAMPLES

1. Divide the sum of 16,518 and 28,732 by 125.

2. $2\frac{3}{4} + \frac{1}{2} + 5\frac{1}{8} + 4\frac{1}{4} + 3\frac{7}{8}$

3. 12 is what part of 18? 27 is what part of 36?
16 is what part of 20? 25 is what part of 30?

4. If grapefruit are selling at 3 for a quarter, what is the cost per dozen?

5. Find the cost of 4 lb. crackers at $12\frac{1}{2}¢$ a pound.

6. Estimate the cost of 12 chairs at \$5.85 each. Find the actual cost.

7. Find $\frac{2}{3}$ of $5\frac{1}{4}$ yard.; $\frac{3}{5}$ of $12\frac{1}{2}$ in.

8. Find the difference between \$682.50 and the sum of \$51.74, \$28.19, \$34.28, \$166.75, \$103.02.

9. From 50% of 1,608 take $33\frac{1}{3}\%$ of 858.

GENERAL PROBLEMS

1. What is the cost of 240 yd. of cloth at $37\frac{1}{2}¢$ a yard?

2. A boy bought some chocolate bars at 45¢ a dozen and sold them at 5¢ apiece. How much did he make on 36 bars?

3. During the first four weeks of a summer vacation Walter Brown earned \$1.75, \$2.70, \$2.35, \$2.40. What was his average per week? At this rate how much would he earn in a vacation of nine weeks?

4. Tell how much must be paid for $6\frac{1}{4}$ lb. beef selling at 32¢ a pound, $2\frac{1}{2}$ doz. eggs at 42¢ a dozen, $2\frac{3}{4}$ lb. butter at 40¢ a pound, and $4\frac{1}{2}$ qt. milk at 14¢ a quart.

5. The entire expense of a real-estate dealer in buying a tract of land, cutting it up in lots, and advertising it was \$8,000. He sold 5 lots for \$750 each, 4 lots for \$675 each, and 7 lots for \$550 each. What was his profit?

6. What will be the cost of 15 pencils that sell at the rate of 3 for a quarter?

7. A tank that holds $17\frac{1}{2}$ gallons of water is $\frac{4}{5}$ full. How many gallons of water are in the tank?

8. A man's pay was increased from \$.63 an hour to \$.75 an hour. How much more did he earn in a week of six 8-hour days?

9. One man's car averages 14 miles per gallon of gasoline and another man's car averages 23 miles per gallon. How much farther can the second man go than the first on 75 gallons of gasoline?

10. It cost \$525 to run a boys' camp of 75 boys for 2 weeks. What was the cost per week for each boy?

11. Two yards of ribbon were cut into $4\frac{1}{2}$ in. lengths to make badges. How many badges were made?

12. A man has a piece of property with a frontage of 316.45 ft. He cuts it up into 3 lots. One lot has a frontage of 107.5 ft., and another a frontage of 102.2 ft. What is the frontage of the third lot?

13. A man has a farm of 48 acres. 36 acres are worth \$80 an acre and 12 acres are worth \$76 an acre. What is the farm worth? What is the average price per acre?

14. A boy walked $\frac{3}{4}$ mile in 15 minutes. At this rate how long would it take to walk 2 miles?

GENERAL TESTS

I

1. Which of these numbers are divisible by 2? by 3? by 5?

   42 27 16 60 25

2. $27\frac{4}{9} - 15\frac{1}{2}$

3. 30 is $\frac{5}{8}$ of what number?

4. What part of 24 is 16?

5. Take 75% of 104 from 91.

6. Find the cost of 32 yd. of cloth at $62\frac{1}{2}¢$ a yard.

II

1. Add.

   $714.66
   308.91
   253.07
   44.12
   631.25
   120.83
   415.64
   528.30

2. $\frac{3}{4} + \frac{1}{2} - \frac{2}{3}$

3. $\$3{,}161.25 \div 75$

4. $\frac{2}{3}$ of 87 is 25% of what number?

5. Find the area of a city lot 45.2 ft. wide and 74 ft. deep.

6. There are 75 bushels of wheat in a bin. This is $\frac{5}{8}$ of the number of bushels the bin will hold. How many bushels will it hold?

III

1. $\$6{,}020.70 - 1{,}346.85$

2. $7\frac{1}{5} \div 8$

3. $42\frac{1}{3} + 16\frac{1}{4} + 21\frac{5}{6} + 18\frac{1}{2}$

4. When sweet potatoes are selling at 6 pounds for a quarter, what will be the price of 24 pounds?

5. Find the cost of 48 lb. butter at $37\frac{1}{2}¢$ a pound.

6. Leslie bought weekly papers for $3\frac{1}{2}¢$ each and sold them for 5¢ a copy. How much did he make on 150 copies?

CHAPTER IX

DECIMAL NUMBERS

REVIEW OF TENTHS AND HUNDREDTHS

Add. Check results.

1. 14.8 15.3 37.9	**2.** 18. 9.6 7.5	**3.** 15.7 6.43 54.18	**4.** 4.16 80.08 539.7
5. 4.17 24.8 63.75 9.04 38.36 92. 5.43	**6.** 73.28 6.15 132.4 28.66 212. 14.72 344.83	**7.** 122.5 71.25 217.65 8.46 19.21 132.4 80.38	**8.** 216.63 45.17 334.5 16.39 112.15 87.5 274.16
9. 21.2 −14.6	**11.** 214. −136.2	**13.** 112.3 −93.46	**15.** 516. −398.57
10. 132.5 −87.9	**12.** 38.22 −17.9	**14.** 203.02 −78.53	**16.** 400. −155.19

17. 26×.9	**20.** 15×13.6	**23.** 5.6÷8	**26.** 56.43÷9
18. 4×.73	**21.** 7×86.53	**24.** 3.24÷6	**27.** 172.9÷14
19. 9×8.7	**22.** 18×27.05	**25.** 86.8÷7	**28.** 287.7÷42

29. From 500 take the sum of 78.49 and 95.07.

30. From the sum of 51.28 and 38.72 take 65.52.

31. Subtract 151.45 from 501.1; divide the difference by 37.

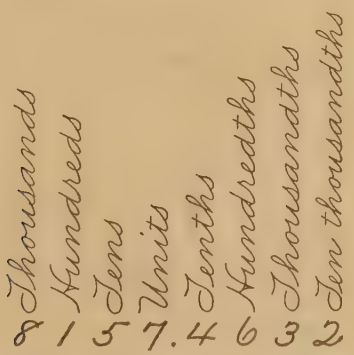
General Decimal Numbers

We have seen that tenths and hundredths may be written as decimal fractions; in writing these decimals one figure at the right of the decimal point expresses tenths, and two figures express hundredths. In the same way, three figures at the right of the decimal point express thousandths and four figures express ten thousandths.

$.007 = \frac{7}{1000}$ It is read, "seven thousandths."

$.325 = \frac{325}{1000}$ It is read, "three hundred twenty-five thousandths."

$.0046 = \frac{46}{10000}$ It is read, "forty-six ten thousandths."



The above number is read, "eight thousand one hundred fifty-seven *and* four thousand six hundred thirty-two ten thousandths."

In reading numbers made up of a whole number and a decimal fraction, the word *and* is always read at the decimal point.

In reading numbers representing dollars and cents, the word *and* is sometimes omitted at the decimal point.

Read these decimal numbers.

1. .37	7. .0143	13. 18.9	19. 8.0026
2. .009	8. .109	14. 26.02	20. 245.302
3. .025	9. .1703	15. 7.003	21. 639.0138
4. .0006	10. .0904	16. 52.096	22. 407.053
5. .125	11. .002	17. 121.35	23. 2,461.814
6. .072	12. .1007	18. 92.174	24. 3,674.125

Writing Decimals

Write in decimal form.

1. $\frac{15}{1000}$	3. $\frac{92}{100}$	5. $\frac{106}{1000}$	7. $\frac{419}{10000}$
2. $\frac{327}{1000}$	4. $\frac{8}{1000}$	6. $\frac{3412}{10000}$	8. $\frac{5}{10000}$

9. Eight tenths
10. Twenty-six hundredths
11. Seventy-two thousandths
12. Three hundred fifty-nine ten thousandths
13. Six thousandths
14. Two thousand five ten thousandths
15. Six and twenty-three hundredths
16. Seventy-nine and four thousandths
17. Four hundred six and thirty-one hundredths
18. Two thousand three hundred five and one hundred eighty one ten thousandths
19. Five thousand nine and three ten thousandths
20. Four thousand four and four thousand four ten thousandths

Reduction of Decimals

With fractions, notice that $\frac{7}{10} = \frac{70}{100} = \frac{700}{1000} = \frac{7000}{10000}$ because each one of the last three of the above fractions is obtained by multiplying both numerator and denominator of the previous fraction by 10.

Expressed decimally, this is: .7 = .70 = .700 = .7000

Annexing zeros to the right of a decimal fraction does not alter its value.

Again, with fractions, notice that $\frac{300}{1000} = \frac{30}{100} = \frac{3}{10}$ for each of the last two fractions is obtained by dividing both the numerator and denominator of the previous fraction by 10.

Expressed decimally, this is: .300 = .30 = .3

Removing zeros from the right of a decimal fraction does not alter its value.

Reduce

1. .4 to hundredths.
2. .8 to thousandths.
3. .750 to hundredths.
4. .37 to thousandths.
5. .46 to ten thousandths.
6. .3080 to thousandths.
7. .5000 to tenths.
8. .0970 to thousandths.

Reducing Decimal Fractions to Common Fractions

Reduce .625 to a common fraction.

$.625 = \frac{625}{1000} = \frac{5}{8}$

To reduce a decimal fraction to a common fraction, express the decimal fraction as a common fraction and then reduce the common fraction to its lowest terms.

Reduce the following decimal fractions to common fractions in their lowest terms.

1. .8	**4.** .125	**7.** .64	**10.** .0005
2. .75	**5.** .006	**8.** .875	**11.** .1225
3. .48	**6.** .375	**9.** .0625	**12.** .0125

ADDITION OF DECIMAL NUMBERS

Add.

14.68
3.056
271.9
50.73
128.009
468.375

In an example of this kind, be sure to keep the figures of the tenths column, the hundredths column, and the thousandths column, in vertical lines.

Add. Check results.

1. 6.75	**2.** 307.6	**3.** 58.09	**4.** 219.17
31.24	19.28	127.2	427.85
5.93	8.5	35.98	13.56
231.67	46.49	781.53	614.09

Add each of these columns in one minute or less.

5. 75.16	**6.** 496.7	**7.** .1357	**8.** 4.7716
2.198	74.691	9.608	28.434
34.9	307.24	.4206	.8685
243.27	9.478	.7153	7.309
6.109	673.	2.0512	16.
55.08	8.008	.9217	.4729
450.6	.996	1.4695	76.218

See page 313 for additional drill examples.

SUBTRACTION OF DECIMAL NUMBERS

From 38.72 take 16.975.

A. 38.720 — 16.975 — 21.745

In this example we annex a zero to the minuend to give it the same number of decimal places as the subtrahend. We then subtract, placing a decimal point in the result directly under the other decimal points.

B. 93.6 — 27.143 — 66.457

In actual practice we seldom annex the zeros, but subtract as if the zeros were there.

Subtract. Check results.

1. 48.93 − 27.86	**4.** 223.5 − 96.33	**7.** 9.273 − 2.108	**10.** 15.205 − 6.17
2. 70.28 − 45.9	**5.** 51.72 − 24.368	**8.** 321.2 − 76.384	**11.** 81.1 − 42.726
3. 40.02 − 15.96	**6.** 62.07 − 31.465	**9.** 33. − 16.921	**12.** 70. − 16.285

See pages 313 and 314 for additional drill examples.

PROBLEMS

1. The distance from Boston to New Haven is 156.8 mi. and from New Haven to New York is 72.3 mi. How far is it from Boston to New York by this route?

2. At the beginning of an automobile trip Mr. Williams' speedometer registered 418.7 miles. At the end of the trip it registered 531.2 mi. How many miles did he travel?

3. A triangular lot is 72.8 ft. on one side, 93.5 ft. on another side, and 68.9 ft. on the third side. How many feet of fence will be required to inclose it?

4. The cost of a new bicycle was $35.00 and the cost of a second-hand bicycle was $24.50. What was the difference in price?

5. A city whose area is 21.75 sq. mi. annexed a suburb whose area is 10.94 sq. mi. What is the area of the enlarged city?

6. A normal boy 8 years old should be 47.8 in. high and he should weigh 53.9 lb. At 13 years he should be 57.2 in. high and weigh 84.8 lb. What should be the gain in height and weight in 5 years?

7. How much must be added to 4.972 to make 8.506?

8. Find the difference between 42.16 and the sum of 24.8 and 7.38.

9. During one year the monthly rainfall in New York City was: January, 2.44 in.; February, 1.70 in.; March, 3.38 in.; April, 2.35 in.; May, 3.29 in.; June, 5.57 in.; July, 5.96 in.; August, 1.79 in.; September, 2.74 in.; October, 5.68 in.; November, .68 in.; December, 3.70 in. What was the total rainfall for the year?

10. From a tract of land containing 15.6 A., the following plots were sold: 1.25 A., 2.6 A., 1.85 A., and 2.43 A. How much of the tract was left?

11. The four sides of a farm are 1,698.7 ft., 2,305.82 ft., 1,951.78 ft., 1,560.9 ft. How many feet of fencing will it take to inclose it?

MULTIPLICATION OF DECIMAL NUMBERS

Multiplying by Integers

A.	B.	C.
25.5	6.28	.0693
16	53	46
1530	1884	4158
255	3140	2772
408.0	332.84	3.1878

To multiply a decimal number by an integer, multiply as with ordinary numbers and point off as many decimal places in the product as there are in the given decimal number.

1. 18×42.6
2. 38×4.93
3. 40×75.3
4. 12×8.95
5. $16 \times .328$
6. $85 \times .084$
7. 28×14.5
8. 8×4.125
9. $118 \times .0079$
10. 43×12.18
11. 15×6.284
12. 35×18.23
13. 14×6.172
14. 82×5.065
15. 120×38.6
16. 230×4.28
17. $3{,}600 \times 2.025$
18. $4{,}200 \times .0075$

Multiplying by 10; 100; 1,000

Test these products by actual multiplication.

$10 \times 3.46 = 34.6$	$100 \times .068 = 6.8$
$10 \times .053 = .53$	$1{,}000 \times 7.35 = 7350$
$100 \times 4.8 = 480$	$1{,}000 \times .2453 = 245.3$

To multiply a decimal number by 10, 100, or 1,000, move the decimal point to the right as many places as there are zeros in the multiplier. Annex zeros to the decimal number when necessary.

1. 10×4.62	5. $100 \times \$4.25$	9. $1{,}000 \times 1.15$
2. $10 \times \$3.65$	6. $100 \times .81$	10. $1{,}000 \times .42$
3. $10 \times .078$	7. $100 \times .075$	11. $1{,}000 \times 2.164$
4. 10×53.21	8. 100×3.028	12. $1{,}000 \times .4025$

13. What will be the cost of 100 knives at \$.45 each?

14. A man bought 10 tons of coal at \$14.50 per ton. How much was his bill?

15. A dealer bought 1,000 lb. sugar at \$.065 a pound. What was the total cost?

Multiplying by 5; 50; 25

5 is what part of 10? 50 is what part of 100? 25 is what part of 100?

To multiply a number by 5, first multiply by 10 and then divide the product by 2.

To multiply a number by 50, first multiply by 100 and then divide the product by 2.

To multiply a number by 25, first multiply by 100 and then divide the product by 4.

$5 \times 48 = 480 \div 2 = 240$ $\quad 50 \times 24 = 2{,}400 \div 2 = 1{,}200$

$25 \times 16 = 1{,}600 \div 4 = 400$

$5 \times \$2.40 = \$24 \div 2 = \$12$ $\quad 50 \times \$8.60 = \$860 \div 2 = \$430$

$25 \times \$2.80 = \$280 \div 4 = \$70$

(Without pencil)

1. 5×24	4. 5×80	7. 25×12	10. $50 \times \$.72$
2. 5×160	5. 50×14	8. 25×20	11. $50 \times \$6.20$
3. 5×1.2	6. 50×2.6	9. $5 \times \$3.20$	12. $25 \times \$1.20$

PROBLEMS

1. Find the cost of 5 bbl. of apples at $3.60 per barrel.

2. How much would you have to pay for 5 gallons of gasoline at 28 cents a gallon?

3. Find the cost of 50 yd. of cloth at $.60 a yard.

4. Fifty persons ate breakfast in a restaurant that charged $.40 for breakfast. How much money was taken in?

5. A man worked 25 days at the rate of $4.40 a day. How much money did he earn?

Multiplying by Decimal Numbers

A.		*B.*	
	37.48		9.28
	8.2		2.63
	7496		2784
	29984		5568
	307.336		1856
			24.4064

To multiply decimal numbers by decimal numbers, multiply as with ordinary numbers and point off in the product a number of decimal places equal to the sum of the number of decimal places in the multiplier and the multiplicand.

Multiply.

1. 9.7	**3.** 25.16	**5.** 18.64	**7.** 15.77
8.5	5.8	5.37	.625
2. 14.8	**4.** 41.4	**6.** 9.283	**8.** 75.08
7.4	3.76	5.9	.2505

9. 3.8×42.51	15. 1.148×52.6
10. 15.9×83.15	16. $.075 \times .048$
11. 67.5×4.234	17. 15.22×314.67
12. 28.34×64.19	18. 615.8×44.71
13. $.765 \times 30.76$	19. 228.4×16.32
14. 90.49×32.72	20. 4.79×27.61

See page 314 for additional drill examples.

PROBLEMS

1. Find the cost of five chairs at $9.75 apiece.

2. At $14.50 a ton find the cost of 12 tons of coal.

3. A lot is 54.6 ft. wide and 109.2 ft. deep. What is its area in square feet?

4. Knowing that one gallon of water weighs 8.36 lb., find the weight of 75.25 gal. of water.

5. One side of a square lot is 62.84 ft. What is the distance around the lot?

6. How many feet are there in .8 mi.?

7. The circumference of a circle is 3.14 times the diameter. What is the circumference of a circle whose diameter is 37 ft.?

8. At $65.50 a front foot, what will be the cost of a piece of land with a frontage of 58.7 ft.?

9. How much is .75 of 62.8 tons?

10. An airship traveled 3.25 hr. at an average rate of 86.7 miles per hour. How far did it go?

11. One cubic foot of water weighs 62.5 lb. What is the weight of 19.38 cubic feet of water?

DIVISION OF DECIMAL NUMBERS

Dividing by Integers

A. Divide 651.08 by 82.	*B.* 237 ÷ 25	*C.* 28.08 ÷ 45
7.94	9.48	.624
82)651.08	25)237.00	45)28.080
574	225	270
770	120	108
738	100	90
328	200	180
328	200	180

In order to carry out the division, we annex two zeros to 237 in example *B*, and one zero to 28.08 in example *C*.

To divide a decimal number by an integer, divide as with ordinary numbers and place a decimal point in the quotient directly over the decimal point in the dividend.

Zeros must not be annexed to an integer without first placing a decimal point after the integer.

1. 98.8 ÷ 26
2. 100.5 ÷ 15
3. 73.44 ÷ 34
4. 82.45 ÷ 17
5. 253.8 ÷ 47
6. 223.65 ÷ 63
7. 146.08 ÷ 44
8. 299.6 ÷ 35
9. 62.688 ÷ 24
10. 13.734 ÷ 42
11. 72.358 ÷ 26
12. 39.114 ÷ 18
13. 28.91 ÷ 35
14. 452.376 ÷ 72
15. 274.24 ÷ 64

16. The daily wages of 17 laborers amount to $76.50. How much does each receive a day?

17. On one side of a street 1,779.2 ft. long, there are 32 house lots. What is the average width of the lots?

See page 315 for additional drill examples.

Dividing by 10; 100; 1,000

6.87	.493	8.614	.2135
10)68.7	10)4.93	100)861.4	1,000)213.5

To divide a decimal number by 10, 100, or 1,000, move the decimal point to the left as many places as there are zeros in the divisor.

$93.8 \div 10 = 9.38$	$527.4 \div 100 = 5.274$
$.46 \div 10 = .046$	$.64 \div 100 = .0064$

Write the quotients.

1. $\$47.80 \div 10$
2. $3.56 \div 10$
3. $794.6 \div 100$
4. $87 \div 100$
5. $.98 \div 10$
6. $659.4 \div 10$
7. $1{,}786 \div 1{,}000$
8. $.3 \div 100$
9. $16.8 \div 100$
10. If ten tennis balls cost \$5.50, how much does one tennis ball cost?

Dividing by Decimal Numbers

Only enough time should be spent on division by decimal numbers to become familiar with the method and have some practice in it, as such division is little used.

A. Divide 112 by 8. *B*. Divide 1,120 by 80.

What was done to both divisor and dividend of example *A* to make example *B*? What is true of the quotients?

The value of the quotient is not changed if both the divisor and the dividend of an example are multiplied by the same number.

A. Divide 7.82 by 2.3.

$$
\begin{array}{r}
3.4 \\
2.3_{\wedge})\overline{7.8_{\wedge}2} \\
\underline{6\,9} \\
9\,2 \\
\underline{9\,2}
\end{array}
$$

By moving the decimal point in both divisor and dividend one place to the right, as indicated by the check marks ($_{\wedge}$), we have multiplied both divisor and dividend by 10. The divisor is now an integer. The example becomes, 78.2 ÷ 23. The quotient is 3.4.

B. Divide 165 by 6.25.

$$
\begin{array}{r}
26.4 \\
6.25_{\wedge})\overline{165.00_{\wedge}0} \\
\underline{1250} \\
4000 \\
\underline{3750} \\
2500 \\
\underline{2500}
\end{array}
$$

In this example it is necessary to annex two zeros to the right of the decimal point of the dividend, before moving the decimal points.

The work may be simplified somewhat by putting the check mark ($_{\wedge}$) in the dividend only, and following this rule.

To divide by decimal numbers, indicate by a check mark ($_{\wedge}$) in the dividend the number of decimal places equal to the number of decimal places in the divisor, divide as with ordinary numbers and place a decimal point in the quotient directly over the check mark ($_{\wedge}$) in the dividend.

Annex zeros to the dividend when necessary.

1. 1.92 ÷ 2.4	**6.** 72.2 ÷ 9.5	**11.** 11.2 ÷ .14
2. 8.64 ÷ 3.6	**7.** 9.84 ÷ 3.28	**12.** 154.5 ÷ 2.06
3. 49.14 ÷ 6.3	**8.** 31.92 ÷ 5.32	**13.** 26.97 ÷ 4.35
4. 81.48 ÷ 9.7	**9.** 45.5 ÷ 3.25	**14.** 9.6 ÷ .12
5. 23.1 ÷ 5.5	**10.** 14.4 ÷ .09	**15.** 4. ÷ 1.25

APPROXIMATE DIVISION

When the divisor is not contained exactly in the dividend, the quotient may be obtained to as many decimal places as is desired by annexing zeros, if necessary, to the dividend.

Zeros must not be annexed to an integer without first placing a decimal point after the given integer.

A. Divide 814 by 65, finding the quotient to two decimal places.

$$
\begin{array}{r}
12.52 \\
65\overline{)814.00} \\
65 \\
\hline
164 \\
130 \\
\hline
340 \\
325 \\
\hline
150 \\
130 \\
\hline
20
\end{array}
$$

B. Divide 45.3 by 5.36, finding the quotient to three decimal places.

$$
\begin{array}{r}
8.451 \\
5.36\overline{)45.30\wedge000} \\
4288 \\
\hline
2420 \\
2144 \\
\hline
2760 \\
2680 \\
\hline
800 \\
536 \\
\hline
264
\end{array}
$$

Find the quotients to two decimal places.

1. $25.7 \div 15$
2. $803.1 \div 68$
3. $462.78 \div 75$
4. $981 \div 47$
5. $375.3 \div 28.6$
6. $54.4 \div 7.26$
7. $800 \div 9.32$
8. $968.31 \div 34.3$
9. $575.9 \div 27.38$

Find the quotients to three decimal places.

10. $73.13 \div 16.1$
11. $78.29 \div 21.3$
12. $167.4 \div 37.5$
13. $607 \div 64$
14. $15.73 \div 18.2$
15. $75.6 \div 23.4$
16. $72.7 \div 8.6$
17. $24.4 \div 4.3$
18. $73.92 \div 18.3$

See page 316 for additional drill examples.

CHANGING COMMON FRACTIONS TO DECIMAL FRACTIONS

A. Change $\frac{9}{17}$ to a decimal fraction.

$$
\begin{array}{r}
.529 \\
17\overline{)9.000} \\
85 \\
\hline
50 \\
34 \\
\hline
160 \\
153 \\
\hline
7
\end{array}
$$

$\frac{9}{17} = .529$

B. Change $\frac{8}{123}$ to a decimal fraction.

$$
\begin{array}{r}
.065 \\
123\overline{)8.000} \\
738 \\
\hline
620 \\
615 \\
\hline
5
\end{array}
$$

$\frac{8}{123} = .065$

To change a common fraction to a decimal fraction, divide the numerator by the denominator, carrying the quotient to as many decimal places as desired.

Change the following to decimal fractions, carrying the result to not more than three decimal places.

1. $\frac{3}{4}$	5. $\frac{4}{9}$	9. $\frac{21}{25}$	13. $\frac{7}{106}$	17. $\frac{4}{215}$
2. $\frac{4}{5}$	6. $\frac{6}{25}$	10. $\frac{15}{34}$	14. $\frac{6}{187}$	18. $\frac{8}{125}$
3. $\frac{7}{8}$	7. $\frac{39}{50}$	11. $\frac{29}{85}$	15. $\frac{90}{123}$	19. $\frac{348}{517}$
4. $\frac{5}{7}$	8. $\frac{13}{40}$	12. $\frac{88}{91}$	16. $\frac{114}{265}$	20. $\frac{11}{834}$

See page 316 for additional drill examples.

PROBLEMS

1. At \$.35 a peck, how many pecks of potatoes can be bought for \$16.45?

2. At an average speed of 41.8 mi. per hour, how long will it take a train to run 668.8 miles?

3. One gallon of water weighs 8.33 lb. How many gallons are there in a tank containing 614.46 lb. of water?

4. A small block of iron weighs .26 lb. How many such blocks can be made from a piece of iron which weighs 9.1 lb.?

5. A man is planning an automobile trip of 1,010 miles. He hopes to reach his destination in 8 days. How many miles must he average each day?

6. A man sold his farm at the rate of $87.50 per acre for $5,600. How large was the farm?

7. On one side of a street 946.9 ft. long, 17 building lots of the same size are laid out. What is the frontage of each lot?

8. An automobile racer covered 110 miles in one hour. Find to two decimal places the number of miles per minute he traveled.

9. The price of admission to an entertainment was 35 cents and $43.75 was taken in. How many persons were there?

10. A dealer bought 675 lb. of coffee for $265.50. What was the price per pound?

11. The bill for carpeting a room was $91.20. The carpet cost $2.85 a yard. How many yards were used?

12. The diameter of a circle is obtained by dividing the circumference by 3.14. Find to two decimal places the diameter of a circle the circumference of which is 26 in.

13. Twenty-eight persons subscribed $129.78 toward a picnic. About how much did each give?

14. A boy ran 100 yd. in 13 seconds. Find to two decimal places how many feet he ran per second.

Taking a Journey

Mr. and Mrs. Robinson and their two children, Mary and Richard, made a trip to Uncle Arthur's home. Mary was eleven years old and Richard was fourteen.

1. It cost 75¢ to get their baggage to the station and 7¢ each for car fare. What did the baggage charges and the car fare amount to?

2. The railroad fare was $3.20 with half-fare for children under twelve years of age. What was the cost of all the railroad tickets?

3. On the train Mr. Robinson bought two newspapers at three cents each, one magazine at twenty-five cents, two magazines at ten cents, and thirty-five cents' worth of candy. How much did he spend for papers, magazines, and candy?

4. Mr. Robinson counted the number of men in the car, Mary counted the number of women, and Richard walked

up and down the aisle to count the children. They found that there were 28 men, 35 women, and 9 children. How many passengers were in the car?

5. At the next station four men and five women got off their car, but six men and four women and two children came in. How many passengers were then in the car?

6. The Robinsons left their home station at 11 A.M. and at 12 : 30 they reached a station 60 miles away, where they had to change trains. How many miles per hour did their train average on the first part of their journey?

They had to wait until one o'clock for the second train, so they went into the station restaurant for luncheon.

Here is the bill of fare:

Roast beef and potato	$.35	Bluefish and potato	$.30
Dropped eggs on toast	.25	Hashed brown potatoes	.15
Chicken croquettes	.25	Ham sandwich	.10
Baked beans	.20	Stewed corn	.10
Beef stew	.20	Green peas	.10
Baked apple, sliced bananas, or sliced oranges			$.10
Apple, squash, or mince pie			.10
Tea, coffee, or milk			.05

7. Mr. Robinson had roast beef and potato, stewed corn, apple pie, and coffee. What was the amount of his check?

8. Mrs. Robinson had chicken croquettes, hashed brown potatoes, sliced bananas, and tea. What was the amount of her check?

9. Mary had bluefish and potato, green peas, baked apple, and milk. How much was her check?

10. Richard had beef stew, a ham sandwich, mince pie, and milk. What was the amount of his check?

11. What was the cost of all the luncheons?

12. In the waiting-room were twelve long seats. Mr. Robinson thought that eighteen persons could sit comfortably on each seat. How many persons could be seated at once in the waiting-room?

13. Richard counted the number of persons on each seat with the following results: 15, 6, 9, 0, 12, 8, 11, 5, 14, 0, 7, 2. How many more persons could be seated at that time?

14. While they were walking up and down the platform outside the station, Mary noticed a freight car with this printed on the outside: "Capacity 80,000 lb." This means that the car could carry how many tons?

15. Just as the train was starting, a man came into their car. He had to buy his ticket on the train. The rate was three cents a mile with ten cents extra for buying on the train, and he was going to a station 27 miles away. What did he have to pay for his ticket?

16. The total distance to the city where Uncle Arthur lives is 100 miles. How far did they ride on the second train?

17. Uncle Arthur met them at the station and had their baggage sent up. From your answers to questions 1, 2, 3, and 11, tell the total cost of the trip.

CHAPTER REVIEWS

PROCESS REVIEW

1. In what two ways may one tenth be written? one hundredth? six tenths? twenty-eight hundredths? forty-three thousandths?

2. How may decimal fractions be reduced to common fractions?

3. In adding decimal fractions, how should the decimal points be placed?

4. Where is the decimal point placed in the result?

5. Are these same rules followed in subtraction?

6. When a decimal number is multiplied by an integer, how many decimal places are in the product?

7. How can you quickly multiply a decimal number by 10? by 100? by 1,000?

8. What is a short method of multiplying by 5? by 50? by 25?

9. When decimal numbers are multiplied by decimal numbers, how many decimal places are in the product?

10. What effect does annexing zeros to the right of a decimal number have on its value?

11. When a decimal number is divided by an integer, where is the decimal point placed in the quotient?

12. How can you divide a decimal number quickly by 10? by 100? by 1,000?

13. When you divide a decimal number by a decimal number, where do you put a check mark (∧) in the dividend?

14. Where, then, is the decimal point placed in the quotient?

15. When the division is not exact, how can you find the quotient to any number of decimal places?

16. How do you change a common fraction to a decimal fraction?

ORAL EXERCISES

Add.

1. .3	**2.** .4	**3.** .9	**4.** 4.2	**5.** 1.8
.5	.6	.4	9.6	2.2

Subtract.

6. .8	**7.** .6	**8.** 4.6	**9.** 10.7	**10.** 12.8
.2	.6	2.3	3.5	2.8

Multiply.

11. .2	**12.** .1	**13.** .3	**14.** .6	**15.** .8
3	8	5	2	4

Read the following.

16. .26	**18.** .042	**20.** .1785	**22.** 703.82
17. .003	**19.** .105	**21.** 36.4	**23.** 66.0024

24. 10×6.4	**27.** $1{,}000 \times 3.141$	**30.** $5. \times \$8.60$
25. 10×7.27	**28.** $10 \times \$6.75$	**31.** 50×4.20
26. 100×4.21	**29.** $1{,}000 \times .67$	**32.** $25 \times \$1.60$
33. $47.5 \div 10$	**35.** $324.3 \div 100$	**37.** $\$75.20 \div 10$
34. $65 \div 10$	**36.** $58 \div 100$	**38.** $\$1{,}768 \div 100$

DRILL EXAMPLES

Write in decimal form.

1. $\frac{21}{100}$ **2.** $\frac{19}{1000}$ **3.** $\frac{506}{1000}$ **4.** $\frac{138}{10000}$ **5.** $\frac{92}{10000}$

Reduce to common fractions.

6. .65 **7.** .68 **8.** .325 **9.** .075

Add.

10.
9.34
15.26
21.3
175.97
6.73
68.07
317.52

11.
$315.70
42.66
7.27
101.14
19.28
5.25
613.47

12.
26.05
34.12
168.23
19.
.47
226.74
15.06

13. 42.32 − 17.6

14. 75. − 28.46

15. 116.02 − 98.56

16. 6.08×205 **17.** 52.06×48.16 **18.** 60.8×4.375

19. $134.4 \div 16$ **20.** $71.72 \div 22$ **21.** $28.21 \div 35$

22. $173.6 \div 6.2$ **23.** $14.04 \div 2.08$ **24.** $94.05 \div 41.8$

Find the quotients to two decimal places.

25. $214 \div 56$ **26.** $78.4 \div 4.3$ **27.** $773.6 \div 35.27$

Change these common fractions to decimal fractions, carrying the results to three decimal places.

28. $\frac{5}{8}$ **29.** $\frac{11}{18}$ **30.** $\frac{8}{27}$

31. $\frac{9}{115}$ **32.** $\frac{310}{527}$ **33.** $\frac{4}{543}$

GENERAL PROBLEMS

1. During one week Carl earned the following amounts by selling papers: Monday, \$1.02; Tuesday, \$.74; Wednesday, \$.84; Thursday, \$.90; Friday, \$1.06; Saturday, \$1.15. How much did he earn that week?

2. Mary went to the store and bought \$.45 worth of coffee, \$1.70 worth of potatoes, and some flour. When she got home she remembered the cost of the coffee and the potatoes and that she had paid the grocer \$4.00 in all. How much did the flour cost?

3. A tank contains 756 gal. of oil. Knowing that there are 31.5 gal. in a barrel, find how many barrels of oil are in the tank.

4. Lead is 4.18 times as heavy as marble. A block of marble weighs 34.5 lb. What would be the weight of a block of lead the same size as this piece of marble?

5. All the arithmetic test marks of a class of 25 pupils added up to 2,115. What was the class average?

6. A gallon of water weighs 3.36 lb. What is the weight of 42.5 gal. of water?

7. A dealer buys 2 doz. pairs of roller skates at \$1.75 per pair. How much does he pay for the lot?

8. A farmer has 150 bu. of potatoes. He sells half of them for \$97.50. How much does he receive per bushel?

9. A square park is 161.6 ft. on each side. How much will it cost to put curbing around it at \$1.50 a foot?

10. A man drove his car 229.5 miles on 18 gallons of gasoline. How many miles did he average per gallon?

11. During one season Ralph's father drove 3,069 miles and used 165 gallons of gasoline. How many miles per gallon did he get?

12. A farmer had 52 barrels of apples. He sold $\frac{3}{4}$ of them at \$5.25 a barrel and the rest at \$4.50 a barrel. How much did he receive for his apples?

13. One week Arthur sold 148 papers and 77 magazines. He made $\frac{1}{2}$ cent on each paper and 2 cents on each magazine. How much did he make from his sales that week?

14. Find the cost of a lot 8 rd. $\times$ 10 rd. at 15 cents per square foot.

15. From a piece of cloth $15\frac{1}{2}$ yd. long, two pieces were cut. One was $2\frac{1}{3}$ yd. long and the other was $5\frac{1}{4}$ yd. long. How much of the cloth was left?

16. The distance between two cities is 348.5 miles. How much longer will it take an automobile to go from one city to the other if it travels at the rate of 20.5 miles an hour than a train which covers the distance in $8\frac{1}{2}$ hours?

17. Mr. Jackson hired a man to work for him at \$4.50 a day and a boy at \$2.75 a day. They worked two days. How much did Mr. Jackson have to pay for their work?

18. A single-trip ticket between two cities costs \$1.76 while a round-trip ticket is \$3.25. How much is saved by buying a round-trip ticket instead of two single-trip tickets?

19. To make a box cover, three boards are nailed together side by side. One is $7\frac{3}{4}''$ wide, the second is $4\frac{11}{16}''$ wide and the third is $5\frac{1}{8}''$ wide. What is the width of the box cover?

20. With railway mileage at \$.035 a mile, how much would it cost to travel 275 miles?

21. A boy took a four-hour trip on his bicycle. The first hour he rode 8.6 mi., the second hour, 9.1 mi., the third hour, 7.8 mi., and the fourth hour, 6.3 mi. What was his average rate per hour?

22. A farmer had 56 acres of wheat yielding 18.5 bushels per acre. With wheat at \$1.15 a bushel, what was the value of the crop?

23. A camera film with 6 exposures costs 30¢, developing a film costs 10¢, and printing 4¢ a picture. What, then, will be the cost of taking and finishing a dozen pictures?

24. During a summer vacation of 9 weeks, Carl worked to earn a \$35 bicycle. He received \$1.50 each Saturday for working for the grocer, 75¢ a week from his father for work around the house and yard, \$8 on his birthday, and \$14.50 from errands and other jobs. He spent \$5.25 during the summer. How much more than the price of the bicycle did he have at the end of vacation?

GENERAL TESTS

I

1. Add:
16.43
275.38
47.5
153.26
64.07
9.3
735.8

2. $\frac{14}{15} \div \frac{7}{9}$

3. 7.4×31.16

4. Find $33\frac{1}{3}\%$ of 240.

5. $\frac{2}{3} + \frac{5}{6} + \frac{7}{9}$

6. How much will $8\frac{1}{4}$ lb. of butter cost at \$.32 a pound?

II

1. $65.21 - 36.435$
2. $58.828 \div 15.4$
3. Write the present year in Roman numerals.
4. Change $\frac{1}{27}$ to a three-place decimal.
5. How many feet and inches are there in 105 inches?
6. 32 is what part of 48?

III

1. Write as a decimal number: five thousand sixty-three and forty-two thousandths.
2. From 71.5 take the sum of 27.59 and 15.296.
3. 17.05×86.34
4. Find the area of a rectangle 7 yd. by 18 ft.
5. $23\frac{1}{6} + 17\frac{2}{3} + 18\frac{5}{9} + 41\frac{1}{2}$
6. Rachel has read 60 pages of a story book. This is $\frac{4}{9}$ of the number of pages in the book. How many pages has she still to read?

IV

1. Divide 31.1025 by 4.35.
2. Find the sum of: 67.21, 3.9, 45.86, 17.3, 5.08, 286.7, 1.53, 175.6.
3. $26\frac{1}{4} - 19\frac{3}{5}$
4. $\frac{8}{15} \div 10\frac{2}{3}$
5. Change 390 hr. to days and hours.
6. A grocer bought a case containing 180 oranges for \$5.70 and sold them for 45¢ a dozen. How much did he make on the case?

IMPROVEMENT TESTS

This exercise is given to test you on the work of the first half-year. Try to get 100 points on each group and a total of 400 points on the exercise. The rating of each problem is indicated.

I. Addition

1.
625
(7) 392
416
843
405
264
670
783

2.
$\frac{4}{15}$
(3) $\frac{8}{15}$

3.
$\frac{7}{8}$
(4) $\frac{7}{8}$

4.
$\frac{1}{4}$
(4) $\frac{5}{8}$

5.
$\frac{3}{4}$
(5) $\frac{5}{6}$

6.
$4\frac{1}{2}$
(5) $3\frac{1}{4}$

7.
$5\frac{1}{3}$
(7) $3\frac{1}{2}$

8.
\$5.16
(4) 7.93
8.24
6.38

9.
7.9
(4) 15.234
.59
18.069

10.
18
(4) $9\frac{2}{5}$

12.
$6\frac{1}{5}$
(7) $1\frac{3}{4}$

14. $9\frac{5}{8}+10\frac{1}{2}+6\frac{3}{4}$
(10)

11.
$15\frac{1}{2}$
(5) $21\frac{1}{2}$

13.
$3\frac{5}{6}$
(8) $4\frac{3}{8}$

15. $4\frac{1}{3}+2\frac{5}{6}+3\frac{1}{4}$
(11)

16. $2\frac{1}{2}+3\frac{2}{5}+4.7$
(12)

II. Subtraction

1.
\$7.23
(4) 2.65

2.
503
(5) 257

3.
6,000
(6) 2,374

4.
42,103
(7) 18,566

5.
17.63
(5) 4.9

6.
32.1
(7) 16.45

7.
$12\frac{2}{3}$
(5) 7

8.
$14\frac{5}{8}$
(6) $8\frac{3}{8}$

9. $15\frac{3}{4}$
(6) $6\frac{1}{2}$

10. 20
(8) $9\frac{3}{5}$

11. $16\frac{1}{6}$
(10) $10\frac{5}{6}$

12. $18\frac{1}{4}$
(11) $11\frac{2}{3}$

13. $73-25.64$
(8)

14. $12.4-3\frac{4}{5}$
(12)

III. Multiplication

1. 426
(4) 75

2. 3,402
(3) 6

3. 287
(5) 340

4. 654
(5) 408

5. 750
(5) 68

6. \$8.35
(5) 72

7. 36
(7) $7\frac{2}{3}$

8. 42
(7) $8\frac{1}{5}$

9. $\frac{5}{6}$ of 30
(3)

10. $\frac{4}{5}\times\frac{15}{18}$
(5)

11. $37\frac{1}{2}\%$ of 32
(7)

12. $1\frac{5}{9}\times\frac{3}{4}$
(6)

13. $22\times\frac{3}{8}$
(5)

14. $1\frac{1}{8}\times6\frac{2}{3}$
(8)

15. $6\frac{3}{4}$
(6) 5

16. 8.26
(5) 45

17. 16.04
(7) 3.5

18. .015
(7) 9.4

IV. Division

1. $7\overline{)\$372.82}$
(5)

2. $63\overline{)29,925}$
(6)

3. $56\overline{)13,790}$
(7)

4. $85\overline{)51,680}$
(8)

5. $8\div\frac{5}{6}$
(6)

6. $\frac{5}{12}\div\frac{3}{4}$
(6)

7. $\frac{4}{5}\div6$
(7)

8. $7\frac{1}{2}\div6\frac{1}{4}$
(10)

9. $70.2\div15$
(10)

10. $185.42\div7.3$
(11)

11. $300\overline{)\$75}$
(12)

12. $.64\overline{)720}$
(12)

CHAPTER X

PERCENTAGE AND ITS USES

SPECIAL PER CENTS

The following table of equivalents contains per cents used frequently in business. Memorize the table both ways so that you can say $12\frac{1}{2}\% = \frac{1}{8}$, or $\frac{1}{8} = 12\frac{1}{2}\%$.

$25\% = \frac{1}{4}$	$20\% = \frac{1}{5}$	$62\frac{1}{2}\% = \frac{5}{8}$
$50\% = \frac{1}{2}$	$40\% = \frac{2}{5}$	$87\frac{1}{2}\% = \frac{7}{8}$
$75\% = \frac{3}{4}$	$60\% = \frac{3}{5}$	$10\% = \frac{1}{10}$
$33\frac{1}{3}\% = \frac{1}{3}$	$80\% = \frac{4}{5}$	$30\% = \frac{3}{10}$
$16\frac{2}{3}\% = \frac{1}{6}$	$12\frac{1}{2}\% = \frac{1}{8}$	$70\% = \frac{7}{10}$
$66\frac{2}{3}\% = \frac{2}{3}$	$37\frac{1}{2}\% = \frac{3}{8}$	$90\% = \frac{9}{10}$

Using fractional equivalents, find (without pencil)

1. 25% of 28.
2. 20% of 35.
3. $66\frac{2}{3}\%$ of 15.
4. $12\frac{1}{2}\%$ of 72.
5. 10% of 200.
6. 30% of 90.
7. $37\frac{1}{2}\%$ of 24.
8. $33\frac{1}{3}\%$ of 150.
9. 60% of 25.
10. $16\frac{2}{3}\%$ of 42.
11. 70% of 50.
12. 50% of 600.
13. $62\frac{1}{2}\%$ of 64.
14. 80% of 25.
15. $87\frac{1}{2}\%$ of 72.

Find

1. 25% of 344.
2. 60% of 140.
3. $37\frac{1}{2}\%$ of 256.
4. 30% of 290.
5. $66\frac{2}{3}\%$ of 195.
6. 75% of 312.
7. $16\frac{2}{3}\%$ of 408.
8. $33\frac{1}{3}\%$ of 411.
9. 40% of 830.
10. 70% of 970.
11. 75% of 1,300.
12. $66\frac{2}{3}\%$ of 1,392.
13. 80% of 1,925.
14. $87\frac{1}{2}\%$ of 4,216.
15. 75% of 2,948.

PROBLEMS

(Without pencil)

1. A farm of 80 acres is 20% woodland. How many acres of the farm are woodland?

2. In Miss Scott's room $\frac{3}{5}$ of the children are girls. What per cent are girls?

3. Arthur raised 20 bushels of potatoes and sold 70% of them. How many bushels did he sell?

4. During one week Elizabeth earned 50 cents and she put 80% of this amount in the bank. How much did she put in the bank?

5. Ralph agreed to distribute 600 handbills one Saturday. He disposed of $66\frac{2}{3}\%$ of them in the morning. How many did he have to give out in the afternoon?

6. Of the 40 pupils in Miss Adams' room, $62\frac{1}{2}\%$ bought postal savings stamps one Tuesday. How many children bought stamps that day?

(With pencil)

1. When Washington School played the championship game, 60% of the 380 pupils attended. How many Washington pupils went to this game?

2. A farmer picked 272 bushels of apples. 75% of these were "firsts." How many bushels of first-grade apples did he have?

3. A man sold a lot for $2,640. He used $16\frac{2}{3}\%$ of this amount to repair his house. How much did he spend for repairs?

4. A town raised \$615 for an Old Home Week celebration. 80% of this was in cash contributions. How much was paid in cash?

5. How much is 75% of 1,548 gallons?

6. A book agent received $37\frac{1}{2}\%$ of the money he took in. One summer he sold \$704 worth of books. How much was his share?

7. Of the 520 voters in a town, $87\frac{1}{2}\%$ attended town meeting last fall. How many voters were present?

GENERAL PER CENTS

We shall now consider more general per cents where we change the per cents to decimal fractions, by representing them as hundredths. Thus, 6% = .06, 4% = .04, $3\frac{1}{2}\%$ = .035, etc.

A. Find 68% of 175.

175 — 68% = .68
.68
1400 — .68 × 175 = 119
1050
119.00 — 68% of 175 = 119

B. How much is $4\frac{1}{2}\%$ of 86?

86 — $4\frac{1}{2}\%$ = .045
.045
430 — .045 × 86 = 3.87
344
3.870 — $4\frac{1}{2}\%$ of 86 = 3.87

C. How much is 115% of 682?

682 — Just as 85% = .85
1.15
3410 — so, 115% = 1.15
682
682 — 1.15 × 682 = 784.3
784.30 — 115% of 682 = 784.3

Find

1. 16% of 285.
2. 5% of 340.
3. 108% of 115.
4. $6\frac{1}{2}\%$ of 120.
5. 172% of 650.
6. 64% of 142.
7. 112% of $725.
8. $23\frac{1}{3}\%$ of 150.
9. 106% of 614 in.
10. 57% of $900.
11. $52\frac{1}{2}\%$ of 148 lb.
12. 61% of $570.

13. How much is 150 increased by 18% of itself? decreased by 8% of itself?

14. How much is 40 increased by 15% of itself? decreased by 5% of itself?

15. Increase 160 by 30%.
16. Decrease $7.50 by 6%.

See page 316 for additional drill examples.

PROBLEMS

1. Of a street 875 ft. long, 42% has been paved. How many feet have been paved?

2. A baseball team played 25 games and won 76% of them. How many games did it win?

3. A city has 16,450 inhabitants. Of these, 22% live in Ward 1, 26% in Ward 2, 24% in Ward 3, and 28% in Ward 4. How many persons are there in each ward?

4. On the first day of a fair, 350 persons attended. On the second day the attendance was 16% more than on the first day. How many went to the fair the second day?

5. Knowing that a bushel of potatoes weighs 60 lb. and that 78% of the weight of potatoes is water, tell how many pounds of water there are in 130 bu. of potatoes.

6. A real-estate dealer cut a plot of land into 75 house lots. At a special sale he sold 48% of the lots for $550 apiece. How much were the day's sales?

School Attendance

1. On a stormy day last week, 90% of the 40 pupils in Miss Snow's room were present. How many of her pupils were present that morning?

2. Of the 60 eighth-grade pupils, 85% had perfect attendance records last month. How many eighth-grade pupils had perfect records?

3. The school attendance for one week was: Monday, 620; Tuesday, 616; Wednesday, 626; Thursday, 613; Friday, 615. What was the average attendance for the week?

4. Last month the number of pupils belonging to the school was 650. The average attendance was 94% of this number. What was the average attendance last month?

5. What was the average number of pupils absent each day?

APPLICATIONS OF PERCENTAGE

DISCOUNT

Merchants often reduce the price of their goods in order to bring in trade or to dispose of stock which they do not wish to carry over another season. When they do this, they are selling at a *discount.*

The original price of the goods is called the *list price.*

The *discount* is the amount subtracted from the list price.

The new price, after the discount has been deducted, is the *net price,* or the *reduced price.*

Discounts are generally reckoned as a certain per cent of the list price. This per cent is called the *rate of discount.*

A \$4 hat is reduced 20%. Find the reduced price.
20% of \$4 = \$.80, the discount
\$4 − \$.80 = \$3.20, the reduced price

Without using pencil, give the discount and the reduced price in each of the following examples.

	List Price	Rate of Discount		List Price	Rate of Discount
1.	\$1	10%	**4.**	\$2.50	20%
2.	\$6	$33\frac{1}{3}$%	**5.**	\$3	25%
3.	\$2	30%	**6.**	\$24	$12\frac{1}{2}$%

7. A croquet set listed at \$3 was reduced 20%. What was the new price?

8. Sixty-cent candy was marked down 25% at a special sale. What was the reduced price?

9. A slightly damaged \$1.50 book was sold at a discount of 40%. What was the sale price?

10. At a special sale a sporting goods store marked everything down 10%. What was the reduced price of a \$5.50 tennis racket?

In the following examples, the list price and the rate of discount are given. Find the amount of the discount.

\$24, 8%

\$24	list price
×.08	rate of discount
\$1.92	amount of discount

1. \$35, 10%
2. \$42, 25%
3. \$60, 12%
4. \$85, 8%
5. \$46, 15%
6. \$125, 6%
7. \$98, $12\frac{1}{2}\%$
8. \$1.20, $33\frac{1}{3}\%$
9. \$42.60, 10%
10. \$37.50, 12%
11. \$79.80, 30%
12. \$90.60, 40%

A merchant marked down all his \$32 suits 15%. What was the reduced price of the suits?

First solution

\$3 2 list price
$\times$.1 5 rate of discount
1 6 0
3 2
\$4.8 0 discount

\$32.00 list price
-4.80 discount
\$27.20 reduced price

The reduced price was \$27.20.

Second solution (shorter and better)

100%
$-$ 15%
85%

\$3 2
$\times$.8 5
1 6 0
2 5 6
\$2 7.2 0

We subtract 15%, the rate of discount, from 100% and get 85%. This 85% shows what per cent of the list price the reduced price is. We now take 85% of \$32, the list price, and get \$27.20, the reduced price.

Find the selling prices when the following list prices and rates of discount are given. Use the second method given above.

1. \$75, 7%
2. \$135, 5%
3. \$20.40, 25%
4. \$14.50, 8%
5. \$38.60, 2%
6. \$92.60, 10%
7. \$625, 4%
8. \$102,$16\frac{2}{3}\%$
9. \$25, 25%
10. \$120, 20%
11. \$59.20, $12\frac{1}{2}\%$
12. \$76.50, $33\frac{1}{3}\%$
13. \$1,240, 15%
14. \$1,500, 12%
15. \$2,000, 3%

See page 317 for additional drill examples.

STORE DISCOUNTS

1. A \$64 rug was marked "25% off." What was the selling price of the rug?

2. Some satin at \$3 a yard was marked down 15%. What was the reduced price?

3. A \$65 dining-room table was sold at a discount of 12%. What was the selling price?

4. A man had a bill of \$235 marked "2% off for cash." How much would the bill be if he paid cash?

5. A \$13.50 lawn mower was sold at a discount of 10%. What was the selling price?

6. At the end of a season, a woman's \$55 suit was sold at a discount of 25%. What was the reduced price?

7. A dealer sold 18 hats listed at \$4 at a discount of 20%. How much did he receive for these hats?

8. What will be the cost of 20 shovels at \$1.35, with a discount of 8%?

9. Find the cost of a dozen baseball bats at \$1.50 each, with a discount of 6%.

10. In the spring a \$36 winter overcoat was marked down 15%. How much was saved by buying at the reduced price?

11. How much will 12 tents cost if they are listed at \$8.50 and there is a discount of 12%?

12. A man bought the following goods at a department store: \$320 worth of furniture with a discount of 12%; \$140 worth of rugs with a discount of 8%; and \$85 worth of pictures with a discount of 4%. How much was his total bill?

PROFIT AND LOSS

If a merchant sells goods for more than they cost, he makes a *profit*. If he sells for less than the goods cost, he undergoes a *loss*.

If butter costs 32¢ a pound and sells for 39¢ a pound, the profit is 39¢ − 32¢, or 7¢ a pound.

If berries cost a grocer 28¢ a basket and he has to sell them at 24¢ a basket, his loss is 28¢ − 24¢, or 4¢ a basket.

Both profit and loss are generally reckoned as a certain per cent of the cost price. If an article cost \$6 and is sold at a profit of 20%, then the profit is 20% of \$6. 20% of \$6 = \$1.20. The profit is \$1.20 and the selling price is \$6 + \$1.20 = \$7.20.

A shorter method of finding the selling price is shown in these examples.

A. A storekeeper buys some goods for \$65 and sells them at a profit of 16%. What is the selling price?

100%	\$65	As the 16% is profit, we add 16%
16%	×1.16	to 100%, giving 116%, or 1.16. We
116%	390	now find 116% of \$65, by multiply-
	65	ing \$65 by 1.16.
116% = 1.16	65	The result, \$75.40, is the selling
	\$75.40	price.

B. A man bought some fruit for \$76 and sold it at a loss of 20%. How much money did he receive for the fruit?

100%	\$76	As the 20% is loss, we subtract
− 20%	×.80	20% from 100%, leaving 80%, or
80%	\$60.80	.80. Multiplying \$76 by .80, we get \$60.80, the selling price.

PROBLEMS

1. A dealer bought carpeting at a cost of $2.50 a yard and sold it at a profit of 20%. What was the selling price?

2. What was the selling price of oranges that cost 30¢ a dozen and were sold at a profit of $33\frac{1}{3}\%$?

3. Chairs costing $7.50 apiece were sold at a profit of 30%. Find the selling price.

4. What was the selling price of flour which cost $1.40 a bag and was sold at a profit of 25%?

5. On account of water damage, a dealer sold some goods worth $170 at a loss of 35%. How much money did he receive for the goods?

6. Lumber costing $56 per thousand feet was sold at a profit of 25%. What was the selling price?

7. To make room for new stock, $480 worth of old stock was sold at a loss of 6%. How much was received for it?

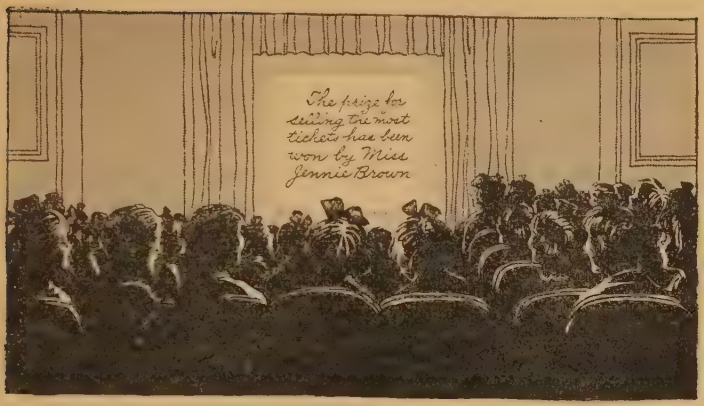
8. A grocer bought 200 lb. of tea at 45¢ a pound and sold it at a profit of 24%. How much did he receive?

A Girl Scout Fair

Some Girl Scouts had a fair one Saturday.

1. They bought 5 gal. ice cream at $2 a gallon and sold it at the rate of 80¢ a quart. How much did they make on ice cream?

2. They bought 20 lb. candy at 40¢ a pound and sold it all in quarter-pound bags at 15¢ a bag. How much did they make on the candy?



3. From $18 worth of material they made 50 aprons which they sold at 75¢ apiece. What was the profit on the apron sale?

4. Five hundred picture post cards were bought for $4 and sold at 2¢ each. What was the profit on the post cards?

5. Handkerchiefs bought at 20¢ each were sold for 25¢. How much money was made on the sale of 50 handkerchiefs?

6. At the food counter the girls sold 75 dozen rolls that cost 18¢ a dozen, at a profit of $33\frac{1}{3}\%$. How much did they make on the rolls?

7. The girls rented a film for $20 and sold 420 tickets for a moving-picture entertainment at 25¢ each. How much did they make at the entertainment, if the expenses in addition to the film were $15?

8. Mr. Robinson offered a prize of $5 to the girl who sold the most tickets to the entertainment. Jennie Brown won by selling 35% of all the tickets sold. How many tickets did Jennie sell?

COMMISSION

Men often buy or sell for others and receive as their pay a certain per cent of the buying or selling price. This per cent is called *commission*.

In this way, farmers often sell their provisions in the city, business houses dispose of their products, and different concerns secure their supplies.

When an agent sells goods on commission and deducts his commission, the amount left is called the *net proceeds*.

A man sells \$900 worth of groceries on a commission of 5%. His commission, then, is 5% of \$900, or \$45. The net proceeds that he turns over to the dealer for whom he is selling goods are \$900 less his commission; that is, \$900 − \$45, or \$855.

When an agent buys goods on commission, the price of the goods increased by the agent's commission gives the *entire* cost of the goods.

An agent bought \$600 worth of lumber on a 5% commission. What was the entire cost of the lumber?

The commission is 5% of \$600, or \$30. The entire cost of the lumber is \$600 + \$30 = \$630.

Without using pencil, tell the commission in each of the following cases.

Amt. of Sale	Rate of Com.	Amt. of Pur.	Rate of Com.
1. \$60	10%	5. \$36	$16\frac{2}{3}\%$
2. \$80	$12\frac{1}{2}\%$	6. \$400	3%
3. \$60	5%	7. \$300	6%
4. \$200	4%	8. \$100	$3\frac{1}{2}\%$

Find the net proceeds with the following sales and rates of commission.

9. \$100, 10%	11. \$300, 2%	13. \$500, 4%
10. \$40, $12\frac{1}{2}$%	12. \$200, 5%	14. \$1,000, 3%

Find the entire cost when the following purchases and rates of commission are given.

15. \$400, 3%	17. \$600, 1%	19. \$800, 6%
16. \$120, $16\frac{2}{3}$%	18. \$150, 20%	20. \$2,000, 8%

See page 317 for additional drill examples.

PROBLEMS

1. An agent purchased \$875 worth of furniture and charged a commission of 4%. What was his commission?

2. Find the commission on a \$1,200 purchase at $3\frac{1}{2}$%.

3. An agent sells 500 lb. of butter at 38¢ a pound and charges 6% commission. How much does he receive?

4. An auctioneer sells \$796 worth of goods at 5%. What is his commission?

5. Find the net proceeds of a sale of \$650 after a commission of 2% is deducted.

6. What are the net proceeds of the sale of a house for \$6,000, if a real-estate agent charges 5% for selling?

7. A farmer sends 30 barrels of apples to the city and they are sold at \$5.50 a barrel. His agent charges 8% commission. How much does the farmer receive?

8. What is the entire cost of \$450 worth of goods bought through an agent whose commission is 4%?

9. A commission merchant bought $930 worth of sugar and charged 2% commission. What was the entire cost of the sugar?

10. Find the entire cost of 300 bu. of wheat bought at $1.20 a bushel, if the agent's commission is 3%.

11. A salesman earns $30 a week and in addition 4% commission on each week's sales. One week he sold $700 worth of goods. What were his total earnings for that week?

12. A real-estate agent sold 175 acres of land for Mr. George at $60 an acre and received $3\frac{1}{2}\%$ commission. What were Mr. George's net proceeds from the sale?

13. Find the net proceeds of the sale of 500 bu. potatoes at $1.25 a bushel, if the rate of commission was 8% and the other charges amounted to $10.50.

14. Find the entire cost of 400 bu. of oats at 40¢ a bushel, if the agent's commission is 4% and freight and cartage amount to $8.25.

INTEREST

Just as people pay a certain sum of money each month for the use of a house, so they pay a certain sum of money each month or each year for the use of money. The amount paid for the use of a house is called *rent*. The amount paid for the use of a sum of money is called *interest*.

A man may need $500 to carry on a certain piece of work or to put through a business transaction, but may not have that amount available. In that case he may borrow the $500 and pay interest for the use of it until he pays back the $500.

If we put our money in a savings bank, the bank pays us interest on whatever amount we put in, as a return for the use of our money.

If \$4 is paid for the use of \$100 for a year, then \$4 is the interest on \$100 for a year.

The amount of money on which interest is paid is called the *principal.* In the above illustration, \$100 is the principal.

Interest is generally reckoned as a certain per cent of the principal per year. This is called the *rate of interest.*

Suppose your father wished to build a garage and lacked \$400 of the money he needed. He could borrow that amount at the rate of 6% a year or \$.06 a year for each dollar borrowed. The rate of interest, then, is 6%. The amount of interest per year is 6% of \$400, or \$24.

Knowing the interest for one year, we can find it for any number of years by multiplying the interest for one year by the number of years.

The interest for two years six months, or $2\frac{1}{2}$ years, will be $2\frac{1}{2}$ times the interest for one year. The interest for three years two months is $3\frac{1}{6}$ times the interest for one year.

A. What is the interest on \$700 for 1 year at 5% ?
5% of \$700 = \$35, the interest for 1 year.

B. Find the interest on \$240 for 4 years at $3\frac{1}{2}$%.

\$240
×.035
1200
720
\$8.400 interest for 1 year

\$8.40
×4
\$33.60 interest for 4 years

C. Find the interest on \$500 for 2 yr. 6 months at 6%.
2 yr. 6 mo. = $2\frac{1}{2}$ yr.

\$500
×.06
\$30.00 interest for 1 year

$2\frac{1}{2} \times \$30 = \$75$ int. for 2 yr. 6 mo.

This example and similar ones can be done by the "line method," which offers opportunity for cancellation.

$$\$500 \times \frac{6}{100} \times \frac{5}{2} = \frac{\overset{5}{\cancel{\$500}} \times \overset{3}{\cancel{6}} \times 5}{\cancel{100} \times \cancel{2}} = \$75$$

DRILL EXAMPLES

Without using pencil, find the interest on these amounts for one year at the rate given.

1. \$100 at 3%
2. \$200 at 4%
3. \$300 at 5%
4. \$400 at 6%
5. \$800 at $4\frac{1}{2}$%
6. \$600 at 3%
7. \$1,000 at 5%
8. \$4,000 at 3%
9. \$5,000 at 4%

Find the interest on these amounts at the rate given and for the time indicated.

1. \$100, 4%, 2 yr.
2. \$200, 5%, 3 yr.
3. \$400, 6%, 2 yr.
4. \$100, 4%, $1\frac{1}{2}$ yr.
5. \$500, 3%, 4 yr.
6. \$800, 4%, 3 yr.
7. \$1,000, 5%, 5 yr.
8. \$1,000, 6%, $2\frac{1}{2}$ yr.

9. Express in years and parts of a year: 2 yr. 6 mo.; 3 yr. 4 mo.; 2 yr. 3 mo.; 4 yr. 2 mo.; 3 yr. 9 mo.; 2 yr. 10 mo.

Find the interest on the following amounts for one year at the rates given.

1. \$485, 4%
2. \$630, 5%
3. \$390, $5\frac{1}{2}$%
4. \$1,275, 3%
5. \$4,800, $4\frac{1}{2}$%
6. \$3,954, 6%

7. What is the interest on \$675 at 4% for 1 yr.? 3 yr.? 4 yr. 6 mo.? 5 yr.?

8. What is the interest on \$830 at 6% for 1 yr.? 6 mo.? 2 yr. 3 mo.? 4 mo.?

9. Find the interest on \$1,320 at $5\frac{1}{2}$% for 1 yr.; for 8 mo.; for 3 yr. 4 mo.; for 6 yr.

10. Find the interest on \$2,400 at $4\frac{1}{2}$% for 1 yr.; for 9 mo.; for 4 yr. 2 mo.; for 6 yr. 8 mo.

11. Find the interest on \$135 for 3 yr. 4 mo. at 5%.

Find the interest on

12. \$280 for 2 yr. 6 mo. at 6%.
13. \$600 for 4 yr. 2 mo. at 4%.
14. \$800 for 3 yr. 6 mo. at 5%.
15. \$130 for 1 yr. 4 mo. at 6%.
16. \$950 for 8 mo. at 3%.
17. \$2,500 for 2 yr. 8 mo. at 6%.
18. \$2,900 for 1 yr. 8 mo. at $4\frac{1}{2}$%.
19. \$3,000 for 10 mo. at 5%.
20. \$4,000 for 2 yr. 4 mo. at 6%.

See page 318 for additional drill examples.

PROBLEMS

1. A man borrowed \$450 on which he was to pay interest at the rate of 4%. At the end of one year he paid both the principal and the interest. How much did he pay?

2. A farmer borrowed \$340 at 5% in the spring, in order to buy fertilizer. How much will the principal and interest amount to when he settles the account at the end of six months?

3. Mr. Robbins borrowed \$625 at 6% interest. What was the total amount he had to pay back at the end of 2 yr. 6 mo.?

4. How much is due on a loan of \$820 at 5% interest, if it is paid at the end of 3 years?

5. What is the amount due on a loan of \$725 borrowed at 6% interest and paid in 2 yr. 3 mo.?

6. Smith and Adams bought \$540 worth of goods and agreed to pay for them in four months with 4% interest. How much was due at the end of four months?

7. To increase his business, Mr. Chapman borrowed \$900 at $5\frac{1}{2}\%$ interest. He paid back both principal and interest at the end of 1 yr. 4 mo. How much did he pay back?

FINDING THE RATE PER CENT

When two numbers are given we can find what per cent one number is of the other, by first finding what *part* it is of the other, expressing this relation in fractional form and then changing this fraction to per cent.

What per cent of 16 is 12?

12 is $\frac{1\frac{2}{16}}{}$ of 16. $\frac{1\frac{2}{16}}{} = \frac{3}{4} = 75\%$. 12 is 75% of 16.

DRILL EXAMPLES

(Without pencil)

1. What per cent of 8 is 2? of 12 is 9?
2. What per cent of 12 is 4? is 6? is 3? is 12?
3. What per cent of a gallon is 1 quart? 3 qt.?
4. Four is what per cent of 8? of 12? of 24? of 40?
5. What per cent of 1 peck is 1 quart? 3 qt.? 5 qt.?
6. What per cent of 16 is 8? is 2? is 4? is 12?
7. 8 inches is what per cent of 1 foot? 14 ounces is what per cent of 1 pound?
8. What per cent of 18 is 9? of 20 is 16? of 15 is 10? of 16 is 6? of 24 is 18? of 36 is 12?

What per cent of 48 is 32?

32 is $\frac{3\frac{2}{48}}{}$ of 48. $\frac{3\frac{2}{48}}{} = \frac{2}{3} = 66\frac{2}{3}\%$.

32 is $66\frac{2}{3}\%$ of 48.

(With pencil)

1. What per cent of 54 is 27?
2. What per cent of 78 is 26?
3. What per cent of 60 is 45?
4. 18 is what per cent of 27?
5. 24 is what per cent of 60?
6. 16 is what per cent of 128?

Tell what per cent the first number is of the second number.

7. 14, 56
8. 36, 96
9. 28, 42
10. 29, 58
11. 17, 51
12. 48, 60
13. 48, 64
14. 75, 120

PROBLEMS

1. Richard had 32 rows in his garden. Four rows were corn. What per cent of his garden was in corn?

2. Of the 45 pupils in Miss Abbott's room, 30 had perfect attendance records one month. What per cent of all Miss Abbott's pupils was this?

3. At an entertainment 120 persons were present and 90 of these were children. What per cent of the audience were children?

4. Nine inches is what per cent of a foot? of a yard?

5. Donald bought a bicycle and repaired and painted it at a total cost of \$16. He sold it for \$22. How much money did he make? What per cent of the cost was this?

FINDING THE PER CENT OF PROFIT ON SALES

In order to find the per cent profit on sales, we first subtract the cost price from the selling price. This gives the amount of *gain* or *profit*. We then find what per cent this profit is of the cost price. The result is the *per cent of profit*.

The word *cost* as used in the following examples is assumed to cover the entire cost of the goods.

A. A merchant buys shoes at a cost of \$5 a pair and sells them for \$7 a pair. What per cent profit does he make?

\$7 selling price
−\$5 cost
\$2 profit

$\frac{\$2}{\$5} = \frac{2}{5} = 40\,\%$.

The per cent profit is 40%.

B. Paint costing \$2.50 a gallon is sold for \$2 a gallon. What is the per cent loss?

\$2.50 cost
\$2.00 selling price
\$ .50 loss

$\frac{\$\ .50}{\$2.50} = \frac{50}{250} = \frac{1}{5} = 20\%$.

The loss is 20%.

In reducing the fraction $\frac{\$\ .50}{\$2.50}$, both amounts are expressed as cents, giving $\frac{50}{250}$.

PROBLEMS

(Without pencil)

In these examples give the amount of profit or loss and the per cent profit or loss.

Cost	Selling Price	Cost	Selling Price
1. \$2	\$3	**4.** \$5	\$6
2. \$4	\$5	**5.** \$6	\$3
3. \$3	\$2	**6.** 50¢	55¢

7. A boy bought papers at 2¢ apiece and sold them for 3¢ apiece. What per cent profit did he make?

8. Small flags costing 75¢ apiece were sold for \$1. What per cent profit was made?

9. Fountain pens which cost \$1 were sold for \$.80. What was the per cent loss?

10. What per cent profit is made on tennis rackets costing \$4 if they are sold for \$5?

11. What was the per cent loss on a bicycle bought for \$24 and sold for \$16?

(With pencil)

1. Bicycles which cost $25 were sold for $35. What per cent profit was made?

2. What per cent profit is realized when eggs bought at 32¢ a dozen are sold for 40¢ a dozen?

3. A dealer sold for $1.50 books which cost him $1.80. What was the per cent loss?

4. A peddler bought berries for 15¢ a basket and sold them for 25¢ a basket. What was his per cent profit?

5. A real-estate agent bought a lot for $1,600 and sold it for $2,200. What per cent profit did he make?

6. What per cent profit did a clothing dealer make when he sold for $49 suits that cost him $35?

7. A consignment of goods which cost a merchant $640 was sold for $480. What was the per cent loss?

8. Tricycles costing a dealer $7.50 were sold at $10 apiece. What per cent profit did the dealer make?

9. Baseball gloves costing $2.40 each were sold for $2.10. What per cent loss was that?

10. Baseballs costing a dealer $7.20 a dozen were sold for 75¢ apiece. What per cent profit did he make?

11. Robert's father bought him a tricycle for $8. When Robert outgrew it, it was sold for $5. What was the loss per cent?

12. Radiophones which cost a dealer $4 were sold for $6. What was the gain per cent?

13. What was the gain per cent when a doll carriage costing $5 was sold for $7?

FINDING PER CENTS BY DIVISION

What per cent of 60 is 17?

17 is $\frac{17}{60}$ of 60.

We change $\frac{17}{60}$ to a decimal by division.

$$\begin{array}{r} .28\frac{1}{3} \\ 60\overline{)17.00} \\ 120 \\ \hline 500 \\ 480 \\ \hline 20 \end{array}$$

We get $.28\frac{1}{3}$; that is, $28\frac{1}{3}\%$.

17 is $28\frac{1}{3}\%$ of 60.

$\frac{20}{60} = \frac{1}{3}$

To find by division what per cent one number is of another, express as a fraction the part the first number is of the other, change this fraction to a decimal, and then write the decimal in per cent form. The number of hundredths gives the per cent required.

1. What % of 50 is 19?
2. What % of 40 is 14?
3. What % of 75 is 42?
4. What % of 80 is 22?
5. What % of 90 is 39?
6. 20 is what % of 64?
7. 44 is what % of 48?
8. 77 is what % of 120?
9. 77 is what % of 132?
10. 49 is what % of 112?

See page 318 for additional drill examples.

PROBLEMS

1. During a school term of 60 days, Lucy was present 56 days. What was her percentage of attendance?

2. Of 32 eggs, 27 hatched out. What per cent of the eggs hatched?

3. On a spelling test of 50 words Esther had 46 right. What per cent did she get on the test?

4. The Jefferson school team played 16 baseball games last season and won 13 games. What per cent of the games played did they win?

5. On an arithmetic test, Robert had 13 questions right out of 15 questions. What was his per cent?

6. Of 24 members of a Girl Scout troop, 19 went on a hike together. What per cent of the troop went on that hike?

7. Of 42 pupils in Miss Shaw's room, 35 agreed to have a garden last summer. What per cent of Miss Shaw's pupils enrolled as gardeners?

8. One week Charlotte earned 75¢ and put 65¢ of this amount in the bank. What per cent of her earnings did Charlotte put in the bank that week?

9. Coffee costing 30¢ a pound was sold for 43¢ a pound. What was the per cent of gain?

10. Rugs which cost $32 apiece were sold for $42 each. What was the per cent profit?

11. A furniture dealer bought and repaired an old table at a total cost of $28. He sold the table for $43. What per cent profit did he make?

12. A horse bought for $200 was sold for $245. What was the per cent profit?

13. A real-estate agent bought a house for $4,200. He paid $175 for having it painted and $125 for repairs and other expenses. He then sold the house for $5,040. What was the total cost of the house to him? What was his per cent profit?

Selling Magazines

Kathleen Richards earns money by selling magazines.

1. One month she sold for 5¢ each, 60 magazines that cost 3¢ each. How much did she make on these magazines?

2. She also sold 40 magazines that cost her 12¢ each at a profit of 25%. How much did she make on these?

3. What per cent profit did she make by selling for 20¢ magazines that cost her 15¢?

4. In a recent month Kathleen bought 30 magazines at 7¢ each and sold all but 5 of them at 10¢ each. How much did she make on these magazines?

5. In April Kathleen made $4.80 from magazine sales. This was 80% of the amount she made in May. How much did she make in May?

6. Last month Kathleen took in $35 subscription money. Her commission was 12%. How much was her commission?

7. This month she has taken in $24 subscription money. On half of this she received 12% commission and on the rest, 10%. How much has she earned on subscriptions this month?

CHAPTER REVIEWS

PROCESS REVIEW

1. What is the meaning of the words *per cent?*

2. In what different ways can per cents be written?

3. Name some fractional equivalents for per cents and tell the per cents that they equal.

4. How do you find 25% of anything? $66\frac{2}{3}\%$? $12\frac{1}{2}\%$?

5. How do you find 40%? $37\frac{1}{2}\%$? 70%? $16\frac{2}{3}\%$? $87\frac{1}{2}\%$?

6. How do you find such per cents as 43%? 7%? $3\frac{1}{2}\%$?

7. How can you increase a number by 8% of itself?

8. How can you decrease a number by 5% of itself?

9. What is discount? Why does a merchant mark his goods at a discount?

10. If a merchant marked down 20% all his goods in a certain department, how could he find the reduced prices?

11. How is the amount of profit determined?

12. Profit is also reckoned as a certain per cent of what?

13. How is the amount of loss determined? It is also reckoned as a per cent of what?

14. How is an agent paid when he sells on commission?

15. What are the net proceeds when an agent sells on commission? What is the entire cost when he buys?

16. What is *interest? principal? rate of interest?*

17. How do you find the interest for 1 year? for 3 years? for 2 yr. 3 mo.?

18. How do you find what per cent one number is of another?

ORAL EXERCISES

1. How much is 20% of 45? $33\frac{1}{3}\%$ of 60? $12\frac{1}{2}\%$ of 40?

2. How much is 50% of 80? $66\frac{2}{3}\%$ of 48? 60% of 50? $37\frac{1}{2}\%$ of 32? 70% of 60? 40% of 75?

3. How much is 12 increased by 25% of itself?

4. How much is 27 decreased by $66\frac{2}{3}\%$ of itself?

Find the selling price when

5. The list price is \$2 and the rate of discount is 25%.

6. The list price is 75¢ and the rate of discount is 20%.

7. The cost is \$2.40 and the rate of profit is $16\frac{2}{3}\%$.

Answer the following questions.

	Sales	Rate of Commission	Commission	Net Proceeds
8.	\$500	2%	?	?
9.	\$400	3%	?	?

	Purchases	Rate of Commission	Commission	Entire Cost
10.	\$600	4%	?	?
11.	\$800	6%	?	?

	Principal	Rate of Interest	Time	Interest
12.	\$100	4%	3 yr.	?
13.	\$400	5%	$2\frac{1}{2}$ yr.	?
14.	\$500	6%	1 yr. 4 mo.	?

State the per cent profit when goods costing the first amount are sold at the second figure.

15. \$4, \$6

16. \$6, \$8

17. 60¢, 75¢

18. 80¢, 90¢

19. \$20, \$22

20. \$24, \$28

DRILL EXAMPLES

Find

1. 25% of 1,092.
2. $66\frac{2}{3}\%$ of 558.
3. $37\frac{1}{2}\%$ of 928.
4. 27% of 142.
5. 84% of 950.
6. 73% of 406.

Find the reduced prices at the following list prices and rates of discount.

7. \$72, 5%
8. \$185, 12%
9. \$624, 25%
10. \$140, 15%
11. \$27, 30%
12. \$75, 40%

Find the selling prices when the following cost prices and per cent profits are given.

13. \$15, 8%
14. \$42, 25%
15. \$60, $16\frac{2}{3}\%$
16. \$28, 30%
17. \$150, 6%
18. \$275, 14%

Find the net proceeds of the following sales with the commissions indicated.

19. \$350, 4%
20. \$375, 6%
21. \$500, 3%
22. \$940, 5%
23. \$1,050, 8%
24. \$2,500, 2%

What is the entire cost when the following goods are bought with the given commission charges?

25. \$500, 5%
26. \$725, 4%
27. \$800, 8%
28. \$1,650, 3%
29. \$2,800, 6%
30. \$3,500, 2%

31. Find the interest on \$600 for 2 yr. at 6%.
32. Find the interest on \$800 for 3 yr. 3 mo. at $5\frac{1}{2}\%$.
33. 18 is what per cent of 36? of 27? of 24?
34. 21 is what % of 45? 38 is what % of 64?

The Washington School Baseball Season

1. Last season the Washington School won 18 out of 24 games. What per cent of their games did they win?

2. In their 24 games they made 208 runs while their opponents made only 75% as many. How many runs did their opponents make in these games?

3. At the beginning of the season they ordered $26 worth of suits and supplies, with a discount of 8%. What was the bill for these goods?

4. At the last game of the season, the attendance was 450. Of this number 60% were Washington School pupils. How many Washington pupils were at the game?

5. How much was taken in at the final game if the admission was 10¢?

6. The team took in $125 during the season. The expenses were 64% of this amount. How much did they clear?

7. The team is going to try to make 20% more this year than last year. If they succeed, how much will they make this year?

GENERAL PROBLEMS

1. In a school of 450 pupils, 14% are in the first grade. How many first-grade pupils are there?

2. How much must be added to 120 ft. to increase it 25%? $33\frac{1}{3}$%? 50%? 75%?

3. May had 15 arithmetic questions in a test and her mark was 80%. How many questions did she answer correctly?

4. There are 225 pages in a book of travel. This book has pictures on 48% of the pages. On how many pages are there pictures?

5. If 35% of the 280 pupils in a school had school gardens last year, how many of the pupils had school gardens?

6. A \$36 rug is marked down 15%. What is the new price of the rug?

7. A grocer had 50 dozen bananas. He sold 60% of them at 35¢ a dozen and the rest at 25¢ a dozen. How much did he receive?

8. Richard earned \$28 one summer and he put 65% of it in the bank. How much did he put in the bank?

9. A bicycle marked \$40 was sold at a discount of 15%. What was the reduced price?

10. At a sale a \$45 suit of clothes was marked down 30%. What was the sale price?

11. What will be the cost of 8 books at \$3.50 each, with a discount of 10% for cash?

12. Goods costing \$75 are sold at a profit of 12%. What is the selling price?

13. Find the interest on \$750 for 3 yr. 6 mo. at 4%.

14. An agent sold \$240 worth of groceries on a commission of 6%. How much was his commission?

15. A merchant sells 250 doz. eggs at 30¢ a dozen and charges 4% commission. How much is his commission?

16. How much is the interest on \$1,200 for 2 years at $5\frac{1}{2}\%$?

17. A storekeeper bought 75 chairs at \$6 each and sold them at a loss of 30%. How much did he get for these chairs?

18. Through a commission agent, a farmer sold 200 bushels of potatoes at \$.85 a bushel. The agent charged 6% commission. How much did the farmer receive?

19. What is the interest on \$875 for 2 yr. 6 mo. at 6%?

20. A man bought a \$150 wagon at 10% discount. After using it for a year, he sold it for 10% less than he paid for it. How much did he receive for the wagon?

21. An agent received 3% commission for selling fruit. One day his sales amounted to \$475, the next day \$635, and the third day \$590. How much was his commission?

GENERAL TESTS

I

1. Find 40% of 45.

2. Find the reduced price of a \$35 suit marked down 10%.

3. $12\frac{1}{4} - 11\frac{5}{8}$.

4. Find the interest on \$650 for 1 yr. 3 mo. at 4%.

5. 1.78×25.6.

6. Find 16% of 125.

7. What per cent of 40 is 24?

II

1. Add. $628.50
42.19
721.05
602.37
8.15
123.72
55.19
534.27

2. Find 19% of 176.

3. Find the interest on $145 for 5 yr. 6 mo. at 4%.

4. A rug costing $75 was sold at a profit of 12%. Find the selling price.

5. $5\frac{1}{4} \div 1\frac{1}{8}$

6. A coat that cost $4.50 was sold for $6. Tell the per cent profit.

III

1. Find 135% of 460.

2. 28.4×15.05

3. A real-estate agent sold Mr. Brown's house for $5,200 on a commission of 3%. How much did Mr. Brown receive?

4. Twenty-one of the 35 children in Miss Alden's room got "A" on their arithmetic test. What per cent of them got "A"?

5. Add $1\frac{2}{3}$ to $\frac{3}{4}$ of $\frac{8}{15}$.

6. Find the cost of 2 doz. oranges @ $.35, $6\frac{1}{2}$ lb. meat @ $.32, $2\frac{3}{4}$ lb. butter @ $.40, 1 bu. potatoes at $.30 a peck.

IV

1. How much is $2\frac{1}{2}\%$ of 124?

2. Divide 103.66 by 36.5.

3. Find the interest on $750 for 5 yr. 8 mo. at 4%.

4. How much greater is 83 yd. 2 ft. than 196 ft.?

5. $3\frac{1}{5} \times 12\frac{1}{2}$

6. Some goods bought for $625 had to be sold at a loss of 18%. For how much were the goods sold?

CHAPTER XI

COMPOUND NUMBERS; PLANE FIGURES; CUBIC MEASURE

COMPOUND NUMBERS

A *compound number* is expressed in terms of more than one unit. 2 ft. 3 in. and 6 lb. 5 oz. are compound numbers.

Compound numbers may be changed to simple numbers as follows.

2 qt. 1 pt. $= 2\frac{1}{2}$ qt.	4 gal. 3 qt. $= 4\frac{3}{4}$ gal.
3 lb. 4 oz. $= 3\frac{1}{4}$ lb.	7 ft. 8 in. $= 7\frac{2}{3}$ ft.

When the compound numbers have been changed to this form, the resulting mixed numbers may be added, subtracted, multiplied, or divided.

A. 2 ft. 4 in. + 5 ft. 6 in.	*B.* 6 da. 8 hr. − 2 da. 12 hr.
2 ft. 4 in. $= 2\frac{1}{3}$ ft.	6 da. 8 hr. $= 6\frac{1}{3}$ da.
5 ft. 6 in. $= 5\frac{1}{2}$ ft.	2 da. 12 hr. $= 2\frac{1}{2}$ da.
$7\frac{5}{6}$ ft.	$3\frac{5}{6}$ da.

1. 4 gal. 2 qt. + 3 gal. 1 qt.

2. 5 ft. 3 in. + 6 ft. 6 in.

3. 2 bu. 3 pk. + 8 bu. 3 pk.

4. 9 lb. 8 oz. + 10 lb. 4 oz.

5. 2 pk. 3 qt. + 4 pk. 7 qt.

6. 7 mo. 3 wk. + 5 mo. 2 wk.

7. 4 yd. 2 ft. + 2 yd. 1 ft.

8. 9 wk. 5 da. − 3 wk. 2 da.

9. 8 ft. 3 in. − 4 ft. 6 in.

10. 7 bu. 1 pk. − 2 bu. 3 pk.

11. 8 mo. 1 wk. − 2 mo. 2 wk.

12. 10 pk. 3 qt. − 6 pk. 4 qt.

13. 12 gal. − 5 gal. 3 qt.

14. 15 ft. − 4 ft. 6 in.

A.	*B.*
8×3 gal. 1 qt.	Divide 7 ft. 6 in. by 5.
3 gal. 1 qt. $= 3\frac{1}{4}$ gal.	7 ft. 6 in. $= 7\frac{1}{2}$ ft.
$\underline{8}$	$7\frac{1}{2}$ ft. $\div 5 = \frac{15}{2}$ ft. $\div 5 = 1\frac{1}{2}$ ft.
26 gal.	

1. 4×9 ft. 6 in.
2. 8×2 lb. 4 oz.
3. 12×1 mo. 3 wk.
4. 9×4 ft. 8 in.
5. 6×3 pk. 2 qt.
6. 6 gal. 3 qt. $\div 3$
7. 5 bu. 1 pk. $\div 7$
8. 6 yd. 2 ft. $\div 5$
9. 9 pk. 3 qt. $\div 15$
10. 8 wk. 4 da. $\div 12$

The operations with compound numbers may be performed without changing them to simple numbers.

ADDING COMPOUND NUMBERS

Into a box containing 3 pk. 5 qt. of beans are poured 2 pk. 6 qt. What amount of beans is now in the box?

3 pk. 5 qt.
2 pk. 6 qt.
6 pk. 3 qt.

6 qt. + 5 qt. = 11 qt. = 1 pk. 3 qt.

We place 3 qt. under the quart column and carry the 1 pk. to the peck column.

1 pk. + 2 pk. + 3 pk. = 6 pk.

There are 6 pk. 3 qt. of beans in the box.

Add.

1. 2 gal. 3 qt.
   3 gal. 2 qt.
2. 5 ft. 8 in.
   3 ft. 6 in.
3. 9 lb. 8 oz.
   8 lb. 14 oz.
4. 8 wk. 5 da.
   4 wk. 6 da.
   2 wk. 4 da.
5. 2 bu. 3 pk.
   3 bu. 1 pk.
   1 bu. 2 pk.
6. 5 sq. yd. 6 sq. ft.
   2 sq. yd. 5 sq. ft.
   4 sq. yd. 7 sq. ft.

7. One chicken weighs 4 lb. 10 oz. and another weighs 3 lb. 6 oz. What will be the cost of both at 45¢ a pound?

8. One day Mary and John picked 1 pk. 6 qt. of blackberries and the next day they picked 1 pk. 3 qt. How much did they pick in the two days?

9. A carpenter saws a board into two lengths, one 2 ft. 7 in. and the other 4 ft. 9 in. How long was the board at first?

10. An ocean steamer took 7 da. 4 hr. to go from New York to Liverpool. It remained at Liverpool 5 da. 16 hr. and then took 7 da. 10 hr. to return to New York. How long was it away from New York?

SUBTRACTING COMPOUND NUMBERS

From a piece of cord 6 ft. 4 in. in length Donald cut a piece 2 ft. 6 in. long for his top. How much was left?

6 ft. 4 in.
2 ft. 6 in.
3 ft. 10 in.

As 6 in. is longer than 4 in., we take 1 ft. from the 6 ft., leaving 5 ft. This 1 ft. (12 in.) added to the 4 in. gives 16 in. Then 16 in. − 6 in. = 10 in., and 5 ft. − 2 ft. = 3 ft. There are 3 ft. 10 in. of cord left.

1. 5 qt. 2 pt.
2 qt. 1 pt.

2. 10 wk. 6 da.
4 wk. 1 da.

3. 7 pk. 7 qt.
2 pk. 5 qt.

4. 9 bu. 1 pk.
4 bu. 3 pk.

5. 10 ft. 8 in.
4 ft. 3 in.

6. 32 qt.
7 qt. 1 pt.

7. 17 lb. 5 oz.
6 lb. 11 oz.

8. 8 da. 9 hr.
2 da. 15 hr.

9. 20 sq. ft. 30 sq. in.
9 sq. ft. 64 sq. in.

10. From a cask containing 5 gal. 1 qt. of vinegar, 1 gal. 3 qt. are drawn. How much vinegar is left in the cask?

11. Elizabeth is 4 ft. 6 in. tall and Margaret is 3 ft. 8 in. tall. What is the difference in their heights?

12. From a rope 45 ft. long, 26 ft. 6 in. was used for a swing. How much of the rope was left?

13. From a 30-lb. cheese two pieces were cut. The first weighed 1 lb. 2 oz. and the second 3 lb. 5 oz. How much of the cheese was left?

14. From a piece of lumber 16 ft. long a carpenter sawed first a piece 4 ft. 8 in. long, then a piece 3 ft. 9 in. long. How long was the piece left?

Finding the Difference between Two Dates

A. Find the difference in time between Feb. 16, 1921, and July 10, 1926. July 10, 1926, is the tenth day of the seventh month of 1926. Feb. 16, 1921, is the sixteenth day of the second month of 1921. We take 1 mo., or 30 da., from the 7 mo. and add it to the 10 da., making 40 da. 40 da. − 16 da. equals 24 da.; 6 mo. − 2 mo. = 4 mo. 1926 yr. − 1921 yr. = 5 yr.

Yr.	Mo.	Da.
1926	7	10
1921	2	16
5	4	24

The difference in time is 5 yr. 4 mo. 24 da.

B. Subtract.

Yr.	Mo.	Da.
1930	4	8
1922	7	10
7	8	28

30 da. + 8 da. = 38 da.
38 da. − 10 da. = 28 da.
1 yr. = 12 mo. 12 mo. + 3 mo. = 15 mo.
15 mo. − 7 mo. = 8 mo. 1929 yr. − 1922 yr. = 7 yr.

The difference is 7 yr. 8 mo. 28 da.

Subtract.

	Yr.	Mo.	Da.
1.	1925	10	25
	1921	6	18

	Yr.	Mo.	Da.
2.	1923	8	14
	1919	5	11

	Yr.	Mo.	Da.
3.	1924	9	5
	1920	2	15

	Yr.	Mo.	Da.
4.	1926	2	12
	1909	6	18

	Yr.	Mo.	Da.
5.	1925	5	6
	1916	2	20

	Yr.	Mo.	Da.
6.	1931	8	14
	1925	10	17

7. Find the difference in time between Aug. 14, 1920, and today.

8. Find the difference in time between Nov. 25, 1902, and today.

9. The Civil War lasted from April 12, 1861, to April 9, 1865. How long was this?

10. The World War began on August 4, 1914, and closed with the signing of the armistice on Nov. 11, 1918. How long did it last?

Find the length of life of each of these Presidents.

		Born	Died
11.	George Washington	Feb. 22, 1732	Dec. 14, 1799
12.	Thomas Jefferson	Apr. 13, 1743	July 4, 1826
13.	Abraham Lincoln	Feb. 12, 1809	Apr. 14, 1865
14.	Theodore Roosevelt	Oct. 27, 1858	Jan. 6, 1919

The work on multiplication and division of compound numbers may be omitted from this grade if desired. In any event very little time should be devoted to it.

MULTIPLYING COMPOUND NUMBERS

From a long piece of ribbon, Jean cut three pieces each 1 ft. 10 in. long. How much ribbon did she use in all?

First method

1 ft. 10 in.	As 30 in. = 2 ft. 6 in.
$\times 3$	we change 3 ft. 30 in.
3 ft. 30 in.	to 5 ft. 6 in.
5 ft. 6 in.	

Second method

1 ft. 10 in.	3×10 in. = 30 in. = 2 ft. 6 in.
$\times 3$	3×1 ft. = 3 ft.
5 ft. 6 in.	3 ft. + 2 ft. = 5 ft.
	The product is 5 ft. 6 in.

Multiply

1. 3 ft. 5 in. by 4.
2. 5 wk. 2 da. by 7.
3. 7 yd. 2 ft. by 8.
4. 4 pk. 7 qt. by 3.
5. 6 qt. 1 pt. by 15.
6. 2 hr. 15 min. by 6.

7. How much syrup will 5 cans of the same size contain if each can holds 2 gal. 3 qt.?

8. There are 6 baskets of apples each holding 2 pk. 4 qt. How many pecks of apples does this make?

9. One brick weighs 4 lb. 10 oz. How much will 4 bricks of the same size weigh? 6 bricks?

DIVIDING COMPOUND NUMBERS

During one fall three boys gathered 11 pk. 5 qt. of walnuts and then divided them equally. How much was each one's share?

$$3)\overline{11 \text{ pk. } 5 \text{ qt.}}\quad 3 \text{ pk. } 7 \text{ qt.}$$

Dividing 11 pk. by 3, we get 3 pk. with 2 pk. remainder. Changing the 2 pk. to quarts and adding to 5 qt., we have 16 qt. + 5 qt. = 21 qt. Then 21 qt. ÷ 3 = 7 qt.

* Each boy's share is 3 pk. 7 qt.

1. 25 ft. 10 in. ÷ 5
2. 17 yd. 1 ft. ÷ 4
3. 8 wk. 4 da. ÷ 6
4. 10 lb. 2 oz. ÷ 3
5. 33 gal. 1 qt. ÷ 7
6. 7 hr. 12 min. ÷ 3
7. 4 lb. 6 oz. ÷ 7
8. 28 pk. 1 qt. ÷ 5

9. The distance around Jenny's square flower garden is 14 yd. 2 ft. How long is the garden on each side?

10. A piece of rope 37 ft. 6 in. long is cut into 5 equal parts. How long is each part?

11. The total weight of 3 fish is 4 lb. 5 oz. What is their average weight?

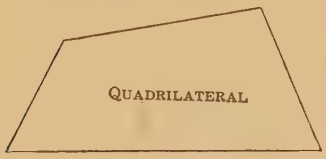
12. A tank holding 11 gal. 2 qt. is half full of gasoline. How much gasoline is in the tank?

13. Find $\frac{1}{8}$ of 19 hr. 4 min.

14. A man walks a distance of 4 miles as follows: The first mile in 14 min. 15 sec.; the second mile in 15 min. 30 sec.; the third mile in 15 min. 25 sec.; and the last mile in 17 min. 10 sec. What was his average time per mile?

PLANE FIGURES

A figure that can be drawn on the blackboard or on any other flat surface is a *plane figure.*



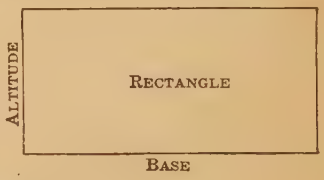
The *perimeter* of a figure is the distance around it.

A *quadrilateral* is a plane figure bounded by four straight lines.

A *rectangle* is a quadrilateral with four right angles.

The *base* of a rectangle is the side on which it is supposed to rest.

The *altitude* of a rectangle is the side perpendicular to the base.



The area of a rectangle is equal to the product of its base by its altitude.

The above rule means that if we multiply the number of units in the length of the base by the number of like units in the length of the altitude, we get a number which represents the number of square units of area. Thus, if the base of a rectangle is 10 in. and the altitude is 6 in., we multiply, $10 \times 6 = 60$, the number of square inches of area.

What measurements would you take to find the area of your schoolroom? To find the area of a city lot?

In finding areas, both the base and the altitude must be expressed in the same unit; that is, both must be expressed in feet, or both must be expressed in inches, or in miles, etc.

Why is this necessary?

Find the areas of rectangles with the following bases and altitudes.

1. 18 ft., 12 ft.
2. 17 rd., 15 rd.
3. 32 in., 14 in.
4. 3 ft., 8 in.
5. 8 yd., 7 ft.
6. 55 ft., 140 ft.
7. 27 ft., $9\frac{1}{3}$ ft.
8. 24 ft., 11 ft. 6 in.
9. $10\frac{1}{3}$ yd., 36 yd.
10. 18 yd., 12 yd. 2 ft.
11. 115 ft., 140 ft.
12. 320 ft., 150 ft.

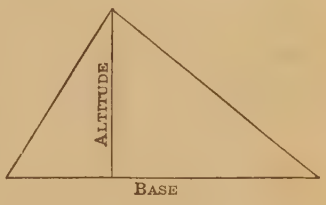
13. Find in square yards the area of a hall 45 ft. long and 36 ft. wide.

14. A lot 74 ft. wide is 16 ft. deeper than it is wide. What is its area?

15. Find the area of a lot $40\frac{1}{2}'$ by $60'$.

16. John found the length of a room to be 8 yd., and James measured its width which is $15\frac{1}{2}$ ft. What is its area?

A *triangle* is a plane figure bounded by three straight lines called the *sides*.

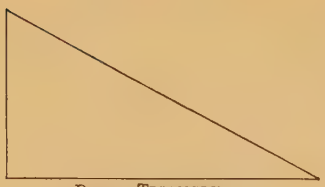


The *base* of a triangle is the side upon which it is supposed to rest.

The meeting points of the sides of a triangle are its *vertices*. Each meeting point is a *vertex*.

The *altitude* of a triangle is the perpendicular distance from the vertex opposite the base to the base or to the base extended.

A *right triangle* is a triangle with one of its angles a right angle.



RIGHT TRIANGLE

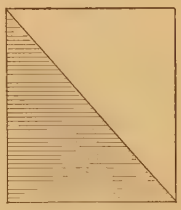
If one of the sides of the right angle is considered the base, then the other side of the right angle is the altitude of the right triangle.

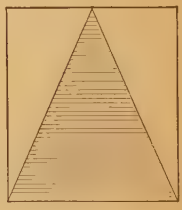
Area of a Triangle

In each of the figures below, what is true about the base of the rectangle and the base of the triangle? about the altitude of the rectangle and the altitude of the triangle?

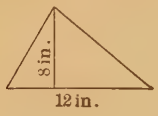
In each figure, what part of the whole rectangle is the triangle?

The area of each of the rectangles is equal to the product of the base by the altitude.





The area of a triangle is equal to one half of the product of its base by its altitude.



Find the area of a triangle whose base is 12 inches and whose altitude is 8 inches.

$\frac{1}{2}$ of $12 \times 8 = 6 \times 8 = 48$, the number of square inches.

The area is 48 square inches.

$\frac{1}{2}$ of $8 \times 12 = 4 \times 12 = 48$, the number of square inches.

The area is 48 square inches.

$\frac{8 \times \overset{6}{\cancel{12}}}{\cancel{2}} = 48$, the number of square inches. The area is 48 sq. in.

To find the area of a triangle we can do any one of three things, all of which give the same result. We can

1. Multiply one half of the base by the altitude.

2. Multiply one half of the altitude by the base.

3. Multiply the base by the altitude and divide the product by 2.

Find the areas of triangles with these bases and altitudes.

1. 12 ft., 10 ft.
2. 22 yd., 12 yd.
3. 34 in., 18 in.
4. 42 ft., 26 ft.
5. 24 yd., 15 yd.
6. 25 ft., 18 ft.
7. 12 yd., 22 ft.
8. 16 ft., $12\frac{1}{2}$ ft.
9. 26 ft., 15 ft. 6 in.
10. 40 yd., 65 ft.
11. 150 ft., 120 ft.
12. 96 in., 7 ft.

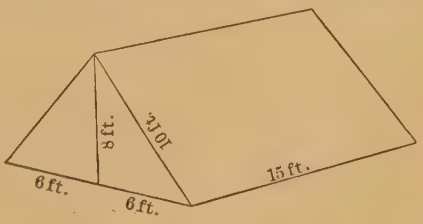
13. A triangular park has a base 76 ft. and an altitude 62 ft. What is its area?

14. An advertising sign is in the shape of a triangle with a base 12 ft. and an altitude of 9 ft. How many square yards of cloth are required to cover it?

PRACTICAL MEASUREMENTS

1. What is the area of each side of the tent shown at the right?

2. What is the area of the front end? What is the area of the back end? What is the area of both ends?



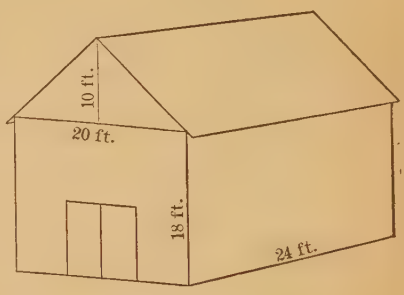
3. What is the total surface of the tent in square feet? in square yards?

4. What is the area of the rectangular part of the front of this barn? of the back?

5. What is the area of one side of this barn? of both sides?

6. What is the area of the front gable (the triangular part at the top)?

7. What is the area of both gables?



8. What is the total area of the front, back, and sides?

9. What will it cost to paint this barn at \$.08 a sq. ft.?

Drawing to a Scale

Using the scale $1'' = 8'$, measure the following lines and tell what distances they represent.

1. _____
2. _____
3. _____
4. _____
5. _____

Give the length of the line required to represent

6. A line 30 ft. long, using the scale $1'' = 10'$.
7. A line 16 ft. long, using the scale $\frac{1}{4}'' = 1'$.
8. A line 50 rd. long, using the scale of $1''$ to 20 rd.
9. A line 48 ft. long, using the scale of $\frac{1}{16}''$ to a foot.
10. A line 15 ft. long, using the scale $\frac{1}{2}'' = 1'$.

Fill in the blank spaces.

	Scale	Given Line	Distance Represented
11.	1 in. = 8 ft.	$2\frac{1}{2}$ in.	—
12.	$\frac{1}{4}$ in. = 1 ft.	4 in.	—
13.	$\frac{1}{2}$ in. = 1 ft.	—	10 ft.
14.	1″ = 10′	$3\frac{1}{2}$″	—
15.	1″ = 8′	2 in.	16 in.
16.	1″ = 10′	$1\frac{1}{2}$ in.	15 ft.

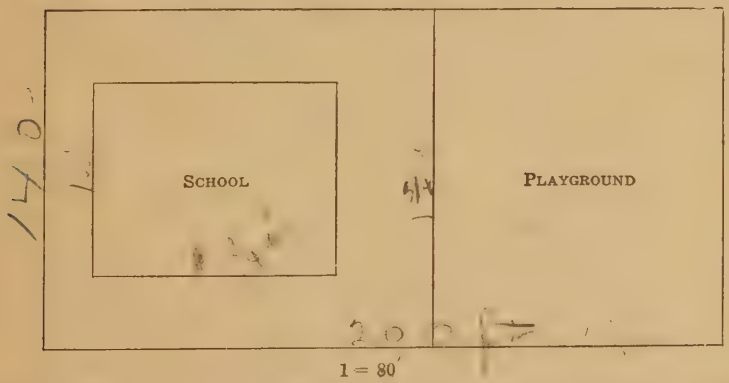
Draw a plan of

17. A rectangle 15′ by 20′, using the scale 1″ = 10′.

18. A room 16′ by 24′, using the scale 1″ = 8′.

19. A table 24″ by 32″, using the scale $\frac{1}{4}$″ = 1″.

20. A lot 60′ by 100′, using the scale 1″ = 20′.



21. What are the dimensions of the entire school lot? What is its area in square feet? in square yards?

22. Find the area of the school building.

23. What is the area of the playground in square feet? in square yards?

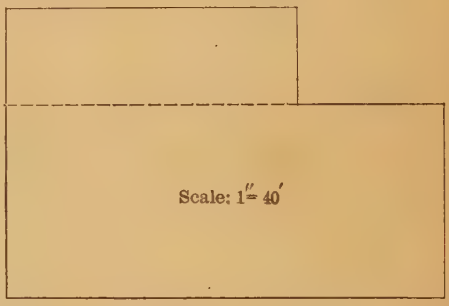
24. Using a convenient scale, draw a plan of your schoolroom.

25. Draw a plan of one of the rooms in your home.

26. Draw a plan of your own lot or a lot near your home.

27. Draw a plan of a farm 80 rd. by 75 rd.

28. Make a copy of this plan of an irregular city lot. Mark the length of all the lines. Notice that by drawing a dotted line we divide the irregular lot into two rectangles.



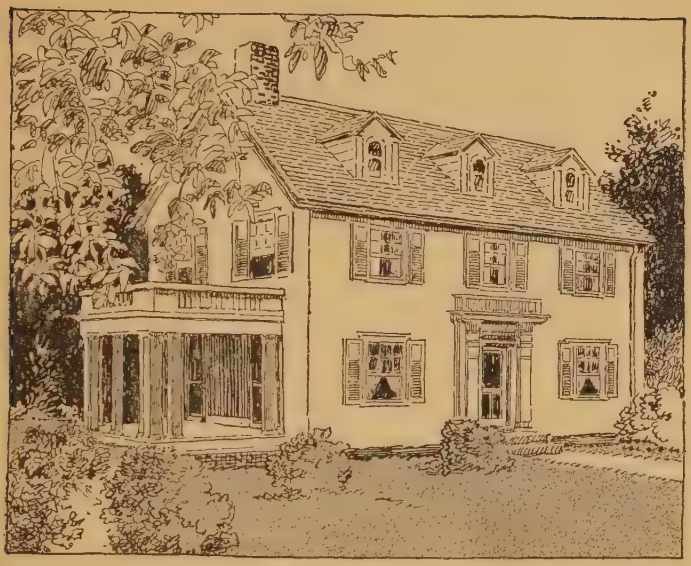
29. What is the entire distance around the lot?

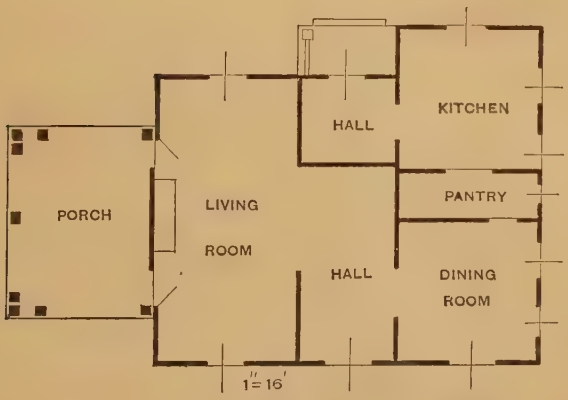
30. What is the area of the part of the lot above the dotted line? below the dotted line? What is the entire area of the lot?

31. What is its cost at \$.75 a square foot?

32. Find the area of this irregular lot by dividing it up into three rectangles. The scale is 1″ = 60′.

A House Plan





FIRST FLOOR PLAN

1. Give the dimensions of each room in the plan on p. 279; of the front hall; of the back hall; and of the sun porch.

2. At six cents a foot, how much will it cost to put picture molding around the walls of the dining-room?

3. Find the area of the floor of each room.

4. How much will it cost to put a new hardwood floor on the living-room at sixty cents a square foot?

5. How much will it cost to cover the kitchen with linoleum at $2.30 a square yard?

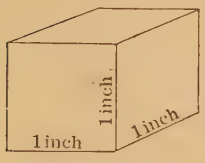
CUBIC MEASURE

A *solid* has length, breadth, and thickness.

A *rectangular solid* is a solid bounded by six rectangles.

The rectangles are the *faces* of the solid and the lines in which they meet are the *edges* of the solid.

A brick is a rectangular solid.



A *cube* is a solid bounded by six equal squares. The squares are the faces of the cube and the lines in which the squares meet are the edges of the cube. How many edges are there in all?

A *cubic inch* is a cube each of the edges of which is equal to 1 inch.

A *cubic foot* is a cube each of whose edges is equal to 1 foot. What is a *cubic yard?*

A *cubic unit* is a cube 1 unit of length on each edge.

The *volume* of a solid is the number of cubic units it contains. The volume is sometimes called the *cubical contents* of the solid.

Place three cubic-inch blocks in a row. Now make three rows of the same kind and place them together, as shown in the drawing.

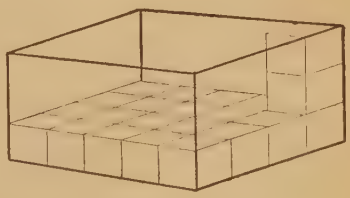
How many cubic inches are there in each row? How many rows are there? How many cubic inches are there in this layer of blocks?

On the layer of blocks you have already made, place two other layers exactly like it.

How many cubic inches are there in each layer? How many layers are there?

How many cubic inches are there in the cube you have made? The volume of the cube is, $3 \times 3 \times 3$ cu. in. $= 27$ cu. in.

Find the volume of a rectangular solid 5 inches long, 4 inches wide, and 3 inches high. (Build this solid with cubic-inch blocks.)



How many cubic inches in a row are in the lowest layer?

How many rows are there?

How many cubic inches are there in the lowest layer?

4×5 cu. in. $= 20$ cu. in.

As the solid is 3 inches high, there are three layers, each containing 20 cu. in. The volume of the solid, then, is 3×20 cu. in. $= 60$ cu. in., or the volume is, $3 \times 4 \times 5$ cu. in. $= 60$ cu. in.

VOLUME OF A RECTANGULAR SOLID

To find the volume of a rectangular solid, multiply its length by its width by its height, and express the result in cubic units.

It is necessary to have the length, the width, and the height expressed in terms of the same unit.

A rectangular solid 8 feet long, 6 feet wide, and 4 feet high may be written: "a rectangular solid 8 ft. × 6 ft. × 4 ft."; or, "a rectangular solid 8′ × 6′ × 4′."

Find the volumes of cubes whose edges are as follows:

1. 2 in.	**3.** 4 in.	**5.** 5 yd.	**7.** 9 ft.	**9.** 10 in.
2. 3 ft.	**4.** 6 ft.	**6.** 8 in.	**8.** 7 yd.	**10.** 11 ft.

11. Find the volume of a tank 10′ × 12′ × 8′.

Find the cubical contents of the following:

1. A brick 8″ × 4″ × 2″.

2. A stone block 5′ × 7′ × 9′.

3. A cube 4 ft. long.

4. A box 11′ × 10′ × $4\frac{1}{2}$′.

5. A tank 8 ft. × $6\frac{1}{2}$ ft. × 7 ft.

6. A room 15′ × 18′ × 12′.

7. A hall 18 yd. × 14 yd. × 6 yd.

8. On a lot 50 ft. by 100 ft. there was 1 foot of snow on the level. How many cubic feet of snow were on the lot?

9. How many cubic inches are in a box 9 inches long, 5 inches wide, and 1 inch high?

10. A schoolroom is 25 ft. long, 24 ft. wide, and 12 ft. high. There are 30 pupils in the room. How many cubic feet of air are allowed for each pupil?

Useful Facts

1 cu. ft. water	= $62\frac{1}{2}$ lb.	1 T. coal	= 35 cu. ft. (about)
1 bu.	= $1\frac{1}{4}$ cu. ft. (about)	1 T. hay	= 500 cu. ft. (about)
1 gal.	= 231 cu. in.		
1 cu. yd. earth	= 1 load	1 cord wood	= 128 cu. ft.

1. How many cords of wood are in a pile 8 ft. long, 4 ft. wide, and 4 ft. high?

2. A tank measures $3\frac{1}{2}$ ft. long, 2 ft. wide, and 2 ft. high. How many pounds of water does it contain when it is full?

3. A coal bin is 10 ft. long, 7 ft. wide, and 6 ft. high. How many tons of coal will it hold?

(Express the work, $\frac{10 \times 7 \times 6}{35}$, and use cancellation.)

4. A large coal bin is 20 ft. long, 14 ft. wide, and 10 ft. high. How much coal will it hold?

5. How many loads of earth must be removed in digging a cellar 30 ft. long, 24 ft. wide, and 6 ft. deep?

6. How many bushels of wheat can be put into a bin $6' \times 5' \times 4'$?

7. How many gallons of gasoline will a can hold that measures $11'' \times 14'' \times 6''$?

8. A tank 3 ft. long and 1 ft. 10 in. wide is filled with oil to a depth of 7 inches. How many gallons are in the tank?

9. A tank 8 ft. long, 6 ft. wide, and 4 ft. deep is half full of water. How many pounds of water are in the tank?

10. A hay-loft, 45 ft. long and 30 ft. wide, is filled to a depth of 10 ft. About how many tons of hay does it contain?

CHAPTER REVIEWS

PROCESS REVIEW

1. How do you add compound numbers? Explain with feet and inches.

2. How do you subtract compound numbers? Explain with pecks and quarts.

3. How can you find the difference between two given dates?

4. What is a quadrilateral? a rectangle? a triangle?

5. What is the base of a figure? What is its perimeter?

6. What is the altitude of a rectangle? of a triangle?

7. How do you find the area of a rectangle?

8. How do you find the area of a triangle?

9. How do you find the volume of a rectangular solid?

ORAL EXERCISES

Add.

1.	2.	3.
2 lb. 4 oz.	5 qt. 1 pt.	4 wk. 5 da.
5 lb. 6 oz.	3 qt. 1 pt.	6 wk. 6 da.

Subtract.

4.	5.	6.
9 ft. 10 in.	15 bu.	4 lb. 4 oz.
6 ft. 5 in.	10 bu. 2 pk.	2 lb. 8 oz.

Find the areas of these rectangles.

	7.	8.	9.	10.
Base	6 ft.	9 in.	2 ft.	12 yd.
Altitude	7 ft.	6 in.	6 in.	9 yd.

Find the areas of these triangles.

	11.	12.	13.	14.
BASE	10 in.	8 ft.	1 ft.	15 in.
ALTITUDE	6 in.	8 ft.	8 in.	10 in.

15. What is the volume of a cube 2 in. on a side?

16. What is the volume of a box $3' \times 2' \times 1'$?

17. How many cubic inches are in a box $4'' \times 5'' \times 3''$?

18. A tank is 9 ft. by 3 ft. by 3 ft. How many cubic yards does it contain?

DRILL EXAMPLES

Add.

1.	2.	3.
7 ft. 9 in.	2 lb. 10 oz.	5 sq. yd. 6 sq. ft.
6 ft. 8 in.	3 lb. 7 oz.	2 sq. yd. 1 sq. ft.
5 ft. 10 in.	1 lb. 4 oz.	4 sq. yd. 8 sq. ft.

Subtract.

4.	5.	6.
26 wk. 1 da.	19 pk. 5 qt.	17 sq. yd. 6 sq. ft.
14 wk. 5 da.	8 pk. 7 qt.	9 sq. yd. 8 sq. ft.

PROBLEMS

1. One package contains 2 lb. 11 oz. and another package contains 1 lb. 6 oz. What is their combined weight?

2. One side of a square lot is 60 ft. 10 in. How far is it around the lot?

3. In the running broad jump one man jumped 20 ft. 2 in. and another man jumped 18 ft. 10 in. How much farther did the first man jump than the second?

4. How many cords of wood are in a pile 12 ft. long, 6 ft. wide, and 8 ft. high?

5. Find your own age today in years, months, and days.

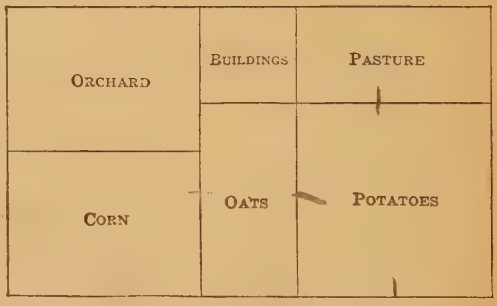
Find the areas of the following figures:

	Rectangles		Triangles	
	Base	*Altitude*	*Base*	*Altitude*
6.	75 ft.	32 ft.	**10.** 38 ft.	27 ft.
7.	29 yd.	17 yd.	**11.** 76 in.	30 in.
8.	42 ft. 6 in.	28 ft.	**12.** 1 ft. 3 in.	2 ft. 4 in.
9.	5 ft.	16 in.	**13.** 6 yd.	14 ft.

14. On a given plan a line is $4\frac{1}{2}$ inches long. If the scale is $\frac{1}{4}'' = 1'$, what distance does the line represent?

15. How many square tiles 8 in. on a side will it take to cover a floor space 6 ft. $\times$ 8 ft.?

16. Here is a plan of Mr. Spaulding's farm, drawn to the scale $1'' = 40$ rd. Make a chart like that given below and fill in the blank spaces.



	Length, Width	Area in Sq. Rd.	Area in Acres
Lot for buildings	? $\times$?	?	?
Pasture	? $\times$?	?	?
Potato lot	? $\times$?	?	?
Oats	? $\times$?	?	?
Orchard	? $\times$?	?	?
Cornfield	? $\times$?	?	?
Whole farm	? $\times$?	?	?

17. Find the volume of a cube 7 in. on each edge.

Find the volumes of the box-shaped solids whose lengths, widths, and heights are given below.

	Length	Width	Height
18.	6 ft.	8 ft.	7 ft.
19.	9 in.	6 in.	5 in.
20.	5 yd.	5 yd.	6 yd.
21.	11 ft.	9 ft.	12 ft.
22.	1 ft.	$5\frac{1}{2}$ in.	3 in.
23.	$8\frac{1}{2}'$	$6'$	$7'$

24. At 75¢ a cubic yard how much will it cost to dig a cellar 24 ft. long, 21 ft. wide, and 6 ft. deep?

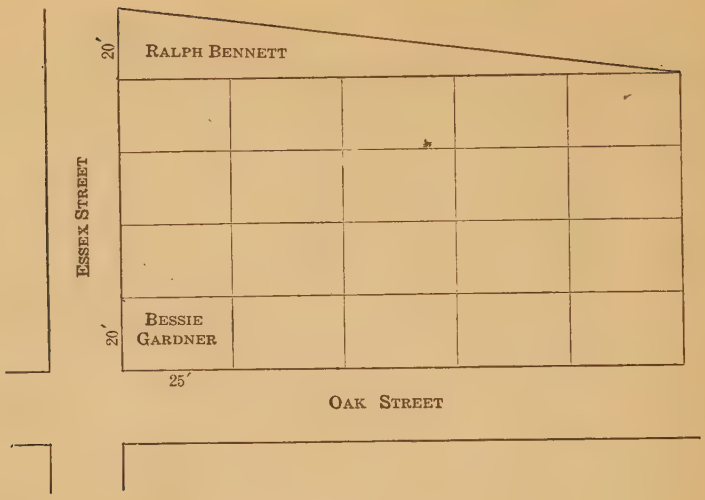
25. A pan is 1 ft. 2 in. long, 11 in. wide, and 6 in. deep. How many gallons does it hold? (1 gal. = 231 cu. in.)

26. How many pounds of water are there in a tank 2 yd. long, 5 ft. wide, and 6 ft. deep, when it is two thirds full?

27. How many cubic inches of soil are needed to fill a flower box 30 in. long, 7 in. wide, and 8 in. deep, inside measurements?

28. Mr. Jacobs has a coal bin $9' \times 8' \times 6'$. He wishes to put in 12 tons of coal. Is the bin large enough? (1 T. coal = about 35 cu. ft.)

29. A schoolroom is 30 ft. long, 27 ft. wide, and 12 ft. high. There are 30 pupils in the room. Each pupil should have 300 cu. ft. of air. Is the room large enough?



The School Garden

In the above school garden, each one of the rectangular plots is 20 ft. × 25 ft.

1. What is the area of each rectangular plot?

2. What is the total area of all the rectangular plots?

3. How far does the school garden extend along Oak Street? along Essex Street up to Ralph Bennett's plot?

4. What is the area of this large rectangle? How does this area compare with the answer to question 2?

5. Ralph Bennett has the triangular plot. Find the area of his plot.

6. What is the total area of the entire school garden?

7. Bessie Gardner paid $1.00 for her plot, seeds, and fertilizer, and she received the following amounts from

her crops: radishes, \$1.30; onions, \$.50; lettuce, \$.94; beans, \$1.30; peas, \$.23; corn, \$.37; tomatoes, \$3.10. How much money did she make on her plot?

8. Alexander Stewart also paid \$1.00 for his plot and then allowed himself \$.15 an hour for every hour he worked on it, which was the price he received for spare-time jobs. He worked 34 hours. He took in the following amounts from his crops: radishes, \$.65; lettuce, \$.75; peas, \$.80; beans, \$.90; carrots, \$.60; corn, \$.53; tomatoes, \$1.95; beets, \$.25; cabbage, \$.21. Did his plot pay for itself and at the same time pay as a spare-time job?

9. William and John Blaine had a garden at their home, about 95′ by 160′ in size. Here is an account of their expenses and receipts in cash.

Expenses		Receipts	
Plowing	\$2.00	179 bunches radishes @	\$.05
Fertilizer	4.50	43 heads lettuce @	.05
Wax beans	.60	43 qt. wax beans @	.05
Lima beans	.40	2 doz. corn @	.35
Radishes	1.00	5 doz. corn @	.30
Onion sets	.40	17 doz. corn @	.25
Cucumbers	.30	43 bunches onions @	.05
Tomatoes	.30	42 cucumbers @	.05
Lettuce	.20	132 cucumbers @	.03
Corn	.60	33 doz. tomato plants @	.25
Potatoes	2.50	$8\frac{1}{2}$ hundred cabbage plants @	.50
Cabbage	.30	10 bu. potatoes @	1.40

How much money did they make on their garden?

10. In addition they had for home use these vegetables, the market values of which are given: 10 bu. potatoes, @ \$1.40; 50 qt. wax beans, @ \$.05; 50 doz. corn, @ \$.25; 40 bunches radishes, @ \$.05; 6 qt. lima beans, @ \$.05; 20 heads lettuce, @ \$.05. How much was the total value of these vegetables?

11. How much was the total profit of the garden?

GENERAL TESTS

I

1. Add. 4 gal. 3 qt.
7 gal. 3 qt.

2. How much is 120 increased by 5% of itself? decreased by 15% of itself?

3. $\frac{8\times7\times25}{14\times10}$

4. Divide \$1,261.50 by 75.

5. Find the area of a triangle with a base 12 ft. and an altitude 10 ft.

6. $1\frac{1}{2} + \frac{3}{4} + 1\frac{5}{8}$

II

1. Find the difference in time between Nov. 28, 1919, and today.

2. 27.5×15.6

3. A \$4 hat was marked down 15%. What was the reduced price?

4. $21\frac{1}{4} - 16\frac{5}{6}$

5. Find the area of a piece of glass 18 in. by 2 ft.

6. $66\frac{2}{3}\%$ of 42 is what per cent of 35?

III

1. Add.
$$\begin{array}{r} 6 \text{ lb. } 9 \text{ oz.} \\ 5 \text{ lb. } 8 \text{ oz.} \\ 26 \text{ lb. } 14 \text{ oz.} \\ 3 \text{ lb. } 5 \text{ oz.} \\ \hline \end{array}$$

2. $\frac{15}{16} \div 2\frac{1}{12}$

3. Using the scale $1'' = 8'$, draw the plan of a room 20 ft. by 26 ft.

4. Divide 50 by 24.5, carrying the quotient to two decimal places.

5. Find the interest on \$1,200 for 2 yr. 9 mo. at 6%.

6. In an audience of 380 persons, 65% were women. How many women were in the audience?

IV

1. Find the interest on \$150 for 5 yr. 4 mo. at 6%.

2. Which is larger, $\frac{5}{6}$ or $\frac{3}{4}$?

3. Find the volume of a tank 8 ft. long, 5 ft. wide, and 2 yd. deep.

4. A piano which cost a dealer \$525 was sold at a profit of 16%. What was the selling price?

5. Which has the larger area, a triangle with a base 40 inches and an altitude 16 inches, or a square 18 inches on each side?

6. Mr. Jackson planned a 5-day automobile trip of 800 miles. His runs for the first four days were as follows: 174.3 mi., 156.8 mi., 168.5 mi., 167.7 mi. How far did he have to go on the fifth day?

CHAPTER XII

TOPICAL REVIEWS

FUNDAMENTAL OPERATIONS

Add. Check results.

1.	2.	3.	4.
468	706	$15.80	$160.88
203	535	4.35	71.16
457	660	8.25	238.10
881	351	21.07	6.45
924	877	14.38	443.28
362	524	37.76	.95
339	211	50.93	182.36
275	442	8.58	20.04
134	165	45.65	765.80
460	306	75.79	189.76

5.	6.	7.
4,351	40,002	$632.04
− 2,786	− 15,134	− 158.36

8. 375×548	10. $62 \times \$57.39$	12. 708×907
9. 605×483	11. $150 \times \$98.40$	13. $1{,}050 \times 2{,}305$
14. $11{,}025 \div 75$	17. $24{,}560 \div 96$	20. $83{,}025 \div 324$
15. $29{,}580 \div 68$	18. $7{,}182 \div 126$	21. $76{,}483 \div 187$
16. $14{,}745 \div 45$	19. $78{,}045 \div 215$	22. $173{,}145 \div 357$

FRACTIONS

1. Reduce these fractions to lowest terms.

$\frac{36}{60}$ $\frac{54}{72}$ $\frac{42}{98}$ $\frac{70}{105}$ $\frac{160}{256}$

2. Reduce these fractions to mixed numbers.

$\frac{75}{8}$ $\frac{77}{12}$ $\frac{86}{15}$ $\frac{137}{16}$ $\frac{223}{18}$

3. Change these mixed numbers to fractions.

$9\frac{7}{8}$ $14\frac{2}{5}$ $17\frac{3}{4}$ $21\frac{5}{6}$ $32\frac{7}{12}$

4. $\frac{1}{3} + \frac{2}{9} + \frac{5}{6}$

5. $\frac{1}{2} + \frac{4}{5} + \frac{3}{4}$

6. $5\frac{2}{3} + \frac{1}{2} + 9\frac{1}{6}$

7. $\frac{7}{10} - \frac{2}{5}$

8. $\frac{2}{3} - \frac{3}{8}$

9. $26\frac{3}{4} - 18\frac{5}{8}$

10. $75\frac{1}{6} - 18\frac{3}{4}$

11. $82 - 53\frac{7}{8}$

12. $\frac{7}{8} - \frac{1}{2} + \frac{3}{4}$

13. $8 \times \frac{3}{5}$

14. $7 \times 9\frac{3}{4}$

15. $\frac{5}{6} \times \frac{8}{15}$

16. $\frac{3}{8}$ of $2\frac{8}{9}$

17. $7\frac{3}{5} \times 3\frac{1}{8}$

18. $\frac{3}{8} \div \frac{9}{20}$

19. $20 \div 2\frac{2}{7}$

20. $5\frac{5}{8} \div 10$

21. $4\frac{2}{3} \div 5\frac{5}{6}$

22. $35\frac{3}{5} - 16\frac{9}{10} + 2\frac{3}{4}$

23. One seventh of a number is 16. What is the number?

24. What part of 25 is 15? What part of 48 is 32?

25. 30 is $\frac{5}{6}$ of what number? Find $\frac{7}{8}$ of $\frac{4}{9}$ of 12 ft.

Using fractional equivalents, find

26. $66\frac{2}{3}\%$ of 735.

27. 75% of 332.

28. $62\frac{1}{2}\%$ of 288.

29. 25% of $33\frac{1}{3}\%$ of 192.

USEFUL MEASURES

1. Change 7 gal. 2 qt. to quarts.

2. Five and one half gallons of milk are to be put in pint bottles. How many bottles are needed?

3. Change 37 pt. to quarts and pints; 91 qt. to gallons and quarts.

4. Change 19 bu. 3 pk. to pecks; 3 bu. 7 qt. to quarts.

5. How much would be saved by buying 5 bu. potatoes at $1.25 a bushel instead of by the peck at $.35 a peck?

6. A train left Washington 1 hr. 5 min. late, but it arrived in New York only $\frac{3}{4}$ hr. late. How many minutes did it make up between Washington and New York?

7. A boy bought $2\frac{1}{2}$ doz. chocolate bars at \$.40 a dozen and sold them for 5¢ apiece. How much did he make?

8. Change 14 lb. 5 oz. to ounces; 122 oz. to pounds and ounces.

9. Knowing that a bushel of onions weighs 52 lb., tell how many bushels there are in a load weighing 1,339 lb.

10. Change 18 ft. 10 in. to inches; 80 ft. to yards and feet.

11. With lots worth \$30 a front foot, what is the value of a lot that has a frontage of 4 rods?

12. A man bought $2\frac{1}{2}$ acres of land. How many square rods did he buy?

Add.

13.	14.	15.
9 wk. 6 da.	25 lb. 15 oz.	6 ft. 8 in.
10 wk. 3 da.	17 lb. 10 oz.	16 ft. 11 in.

Subtract.

16.	17.	18.
9 pk. 2 qt.	8 da. 11 hr.	10 sq. yd. 1 sq. ft.
4 pk. 5 qt.	3 da. 15 hr.	2 sq. yd. 5 sq. ft.

DECIMAL NUMBERS

Add.

1. 17.08; 463; 9.906; 125.37; 82.7; 578.41; 11.695; 4.82.

2. 31.125; 502.77; 63.408; 216.3; 9.06; 42.573; 775; 33.4; 8; 343.169.

3. 64.04 − 56.75 **4.** 320.2 − 164.83 **5.** 514. − 328.602

6. 75×3.82 **8.** 100×4.875 **10.** $.975 \times 80.48$

7. 4.23×6.59 **9.** 50×18.64 **11.** 41.25×6.964

12. $2{,}089.8 \div 86$ **13.** $.897 \div .26$ **14.** $109.392 \div 42.4$

Find quotients to two decimal places.

15. $409.75 \div 73$ **16.** $919.3 \div 26.4$ **17.** $2{,}424.28 \div 53.8$

Change the following common fractions to decimal fractions, carrying the results to three decimal places.

18. $\frac{7}{13}$ **19.** $\frac{15}{51}$ **20.** $\frac{8}{135}$

PERCENTAGE

Find

1. 75% of 272. **5.** $87\frac{1}{2}\%$ of 272. **9.** $5\frac{1}{2}\%$ of \$236.

2. $66\frac{2}{3}\%$ of 525. **6.** 90% of 14.6. **10.** 108% of 450.

3. $37\frac{1}{2}\%$ of 664. **7.** 76% of 315. **11.** $\frac{1}{2}\%$ of 200.

4. 80% of 490. **8.** 29% of \$628. **12.** 120% of \$800.

13. How much is \$650 increased by 12% of itself? diminished by 8% of itself?

14. In the following chart, give the selling price.

	List Price	Rate of Discount	Selling Price
(*a*)	\$8.20	15%	
(*b*)	\$45.00	12%	
(*c*)	\$325.00	8%	

15. Fill in the last column of the following chart.

	Cost	% Profit	% Loss	Selling Price
(*a*)	$4.50	20%		
(*b*)	$250.00		18%	
(*c*)	$67.50		30%	
(*d*)	$1,500.00	16%		

16. In the following chart fill in the spaces which are questioned.

	Amount of Sale	Amount of Purchase	Rate of Commission	Net Proceeds	Entire Cost
(*a*)	$5,400		4%	?	
(*b*)		$650	2%		?
(*c*)	$2,500		3%	?	
(*d*)	$4,800		5%	?	
(*e*)		$1,200	6%		?
(*f*)		$8,500	8%		?

Find the interest on

17. $500 for 3 yr. 6 mo. at 4%.

18. $950 for 2 yr. 4 mo. at 6%.

19. $1,000 for 5 yr. 6 mo. at $4\frac{1}{2}$%.

20. What per cent of 48 is 36?

21. What per cent of 75 is 50?

22. What per cent of 60 is 27?

23. 75% of 56 is what per cent of 84?

24. A bicycle bought for $25 was repaired at a cost

of \$5 and then sold for \$35. What was the per cent profit?

25. In the following table the purchase price, the estimated cost of selling, and the retail price are given. Find the per cent profit.

	Purchase Price	Cost of Selling	Retail Price	Per cent Profit
(*a*)	\$2.80	\$.20	\$4.00	?
(*b*)	\$5.75	\$.25	\$7.50	?
(*c*)	\$1.20	\$.05	\$1.50	?
(*d*)	\$2.30	\$.10	\$2.70	?
(*e*)	\$175.00	\$5.00	\$270.00	?

SURFACES AND VOLUMES

In these rectangles find the parts asked for.

	Base	Altitude	Area
1.	16 ft.	15 ft.	?
2.	12 yd.	25 ft.	?
3.	62 rd.	54 rd.	?
4.	75 ft.	?	4,800 sq. ft.
5.	?	26 mi.	988 sq. mi.
6.	?	9 yd.	864 sq. ft.

Find the areas of triangles with these bases and altitudes.

7. 16 in., 14 in.

8. 28 ft., 18 ft.

9. 8 yd., 12 ft.

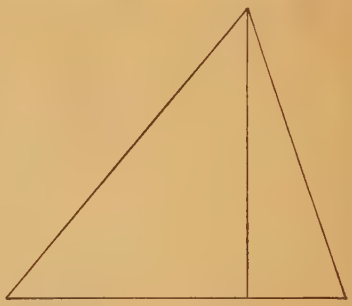
10. 16 ft., 72 in.

11. 15 rd., 10 rd.

12. 85 ft., 75 ft.

13. Find the areas of these figures, using scales indicated:

$1'' = 8'$



$\frac{1}{16}'' = 1'$

Find the volumes of these rectangular solids:

	Length	Width	Height
14.	15′	12′	9′
15.	16 in.	$8\frac{1}{2}$ in.	6 in.
16.	15 yd.	4 ft.	$2\frac{1}{2}$ ft.

GENERAL PROBLEMS

1. During six months Mr. Peterson's electric light bills were as follows: \$2.90, \$3.40, \$3.60, \$3.50, \$3.10. \$2.70. How much did the bills average per month?

2. A nail $2\frac{3}{4}$ in. long is driven into a plank $3\frac{1}{8}$ in. thick. How near does the end come to the other side of the plank?

3. A grocer sent out bills amounting to \$625.40. He collected 65% of this amount. How much did he lose?

4. What number multiplied by 2.6 will produce 23.14?

5. Find the cost of 5 lb. 10 oz. of meat at 32¢ per pound.

6. Mr. Jackson bought a \$45 suit at 10% off, a \$5 hat at 15% off, and four \$1.75 shirts at 20% off. What was his bill?

7. A dealer bought 10 tables at \$30 each. He sold 5 at \$45 apiece. For what price must he sell the remaining five in order to make \$100 on the whole transaction?

8. Which costs the more, a $9' \times 12'$ rug at \$45 or the same amount of carpet at \$3.50 a square yard?

9. How much more interest do you get in a year on \$62 at $4\frac{1}{2}\%$ than on \$65 at 4%?

10. What is the bill for 9 tons of coal at \$13.75 a ton with a charge of 35¢ a ton for carrying in and a discount of 5% for cash?

11. How many pounds of coffee at 44¢ a pound should be given in exchange for 7 lb. butter at 42¢ a pound and 5 doz. eggs at 38¢ a dozen?

12. In a relay race, the time of the four boys was as follows: $20\frac{2}{5}$ seconds, $20\frac{4}{5}$ seconds, $21\frac{3}{5}$ seconds, and $19\frac{4}{5}$ seconds. How much less than two minutes was required for the race?

13. At an average rate of $20\frac{1}{4}$ mi. per hour how far would an automobile go in $2\frac{2}{3}$ hours?

14. At \$30 a ton, what is the value of a load of hay which weighs 3,200 lb.?

15. Which is the higher price for bananas, 20¢ a dozen or 16 for a quarter?

16. How much will be left of 50 yd. of linen after 5 pieces each $8\frac{3}{4}$ yd. long are cut from it?

17. A wheat field 120 rd. long and $\frac{1}{4}$ mi. deep yields 18.75 bu. to the acre. What is the value of the wheat at \$1.10 a bushel?

18. A $4\frac{1}{2}$-yd. remnant of cotton cloth was offered for 72¢. How much cheaper by the yard is this than the regular price, 22¢ a yard?

19. On a spelling test of 50 words, Grace had 45 right. What mark (per cent) should she receive?

20. How much more does a $45 dining table with a discount of 20% cost than a $35 table with no discount?

21. Baseball bats which cost 75¢ are sold for $1 and tennis rackets costing $3 are sold for $3.75. In which case is there the larger money profit? In which case the larger per cent profit?

22. An agent receives $60 a month and 8% of his sales. How much did he receive in a month when he sold $1,500 worth of goods?

23. Desk blotters bought at the rate of $6 a hundred are sold for 10¢ apiece. What is the profit on 1,000 blotters?

24. The length of a rectangular field is 80 rd. and it takes 280 rd. of fencing to go around it. Find its area in acres.

25. At the beginning of a day a grocer had $45.73 in his cash drawer. During the day he took in $116.18 and paid out $17.50. How much was in the cash drawer at the close of business that day?

26. On a large map, $1\frac{1}{2}$ in. represents 10 mi. What is the distance on the map between two places which are really 50 mi. apart?

27. My bill for 5,000 lb. of coal was $33.75. At this rate what would 15 T. cost?

28. The perimeter of a triangular plot of land is 235.23 ft. One side is 75.8 ft., another side is 86.75 ft. Find the third side.

29. How many gallons of paint will be required to paint the outside of a tight fence 9 ft. high around a baseball field 160 yd. by 180 yd. if one gallon of paint covers 450 sq. ft.?

30. On May 1, Mr. Noble bought a second-hand automobile for $800. He paid $300 cash and agreed to pay the balance on August 1, with interest at 6%. What was the total cost of the automobile?

31. A grocer bought 600 lb. of sugar at 5¢ a pound. He sold $\frac{2}{3}$ of it at $6\frac{1}{2}$¢ a pound and the rest at 7¢ a pound. What was his per cent profit on the transaction?

32. A dealer pays $10.80 for a crate of 30 doz. eggs. If he receives a profit of $16\frac{2}{3}\%$, for how much does he sell them by the dozen?

GENERAL TESTS

I

1. Add.

16.51
2.379
.06
27.8
5.907
53.28
7.612
34.15
75.01

2. Change 11 bu. 3 pk. to pecks.

3. $75\frac{1}{3} - 26\frac{3}{4}$

4. 58 is $\frac{1}{6}$ of what number?

5. Find 75% of 540.

6. Multiply 42.75 by 100; by 1,000.

II

1. Subtract. 410.02
   178.76

2. Write 1776 and 1918 in Roman numerals.

3. Change 400 min. to hours and minutes.

4. $3\frac{3}{5} \div 1\frac{2}{25}$

5. A purchase of \$1.58 was paid for with a \$5 bill. Make change with the fewest coins and bills.

6. Find 28% of \$615.

III

1. $275 \times \$16.58$

2. $\frac{2}{3} + 1\frac{1}{15} - \frac{3}{5}$

3. 60 is $\frac{5}{8}$ of what number?

4. 51 is what per cent of 50?

5. Divide \$1,558.75 by 43.

6. A talking machine costing \$75 was sold at a loss of 16%. What was the selling price?

IV

1. Find the average of these distances; 22.5 mi., 17 mi., 19.4 mi., 31.2 mi., 15.8 mi., 20.4 mi.

2. $26.1 \div 7.63$. Find quotient to two decimal places.

3. Reduce $\frac{48}{64}$ to its lowest terms.

4. 9×4 lb. 7 oz.

5. $6\frac{3}{4} \times 1\frac{7}{15}$

6. Change $\frac{8}{125}$ to a decimal.

7. A man borrowed \$240 at 5% interest. He paid back principal and interest in 1 yr. 2 mo. How much did he pay?

8. Oranges bought at the rate of 35¢ a dozen were sold on a fruit stand for 5¢ apiece. How much was made on 8 dozen sold one day?

IMPROVEMENT TESTS

This exercise is given to test your progress in the year's work. Try to secure 100 points in each group and 500 points for the exercise. The rating of each question is shown.

I. Addition

1. (6)

346
485
237
915
502
843
174
655
890

2. (9)

216
25
32
147
16
23
432
18
29
14
325
27

3. (4)

$5.75
7.86
4.30
7.28
6.56

.52
.79
3.458
.67
1.42

5. (3)

$\frac{1}{10}$
$\frac{3}{10}$

6. (3)

$\frac{5}{6}$
$\frac{5}{6}$

7. (4)

$\frac{3}{8}$
$\frac{1}{4}$

8. (4)

$\frac{7}{12}$
$\frac{1}{2}$

9. (5)

$5\frac{2}{3}$
$3\frac{2}{3}$

10. (5)

$4\frac{1}{2}$
$2\frac{7}{8}$

11. (6)

$16\frac{1}{2}$
$8\frac{3}{5}$

12. (6)

$14\frac{5}{6}$
$6\frac{3}{4}$

13. (7)

$13\frac{1}{12}$
$12\frac{3}{4}$

14. (7) $7\frac{3}{4}+9\frac{1}{2}+17\frac{3}{8}$

15. (8) $23\frac{1}{6}+6\frac{1}{9}+9\frac{1}{2}$

16. (7) $\$2.57+\$4+25¢+\$1.06$

17. (12) $5\frac{1}{2}+6.18+1\frac{3}{4}+.02$

II. Subtraction

1. (4)

$8.50
2.36

3. (6)

$52.07
16.33

5. (5)

$9\frac{5}{6}$
$2\frac{1}{6}$

7. (7)

$31\frac{5}{6}$
$15\frac{3}{4}$

9. (11)

$43\frac{1}{8}$
$26\frac{3}{8}$

2. (5)

14.25
7.6

4. (7)

7,000
2,432

6. (6)

$12\frac{3}{4}$
$7\frac{1}{2}$

8. (8)

54
$18\frac{3}{5}$

10. (12)

$65\frac{1}{4}$
$15\frac{5}{12}$

11. (8)

601,002
53,670

12. (9) $75-6.38$

13. (12) $30.1-16\frac{1}{5}$

III. Multiplication

1. 7,084	**5.** $\frac{3}{4}$ of 120	**9.** $1\frac{1}{4}\times5\frac{1}{3}$	**13.** 42
(4) 8	(4)	(7)	(8) $9\frac{5}{6}$
2. 528	**6.** $\frac{2}{5}$ of 17	**10.** $3\frac{1}{3}\times1\frac{7}{8}$	**14.** 623
(5) 407	(5)	(8)	(7) .08
3. 760	**7.** $20\times\frac{5}{8}$	**11.** $45\frac{2}{3}$	**15.** 5.42
(5) 89	(5)	(5) 6	(8) 7.5
4. \$4.35	**8.** $5\frac{1}{2}\times\frac{3}{4}$	**12.** 37	**16.** .095
(6) 640	(7)	(7) $8\frac{1}{4}$	(9) 26

IV. Division

1. $6\overline{)\$495.18}$	**5.** $\frac{4}{5}\div6$	**9.** $65\overline{)352.95}$
(5)	(5)	(10)
2. $54\overline{)41,472}$	**6.** $\frac{8}{9}\div\frac{2}{3}$	**10.** $8.3\overline{)121.18}$
(6)	(5)	(10)
3. $68\overline{)34,544}$	**7.** $6\frac{1}{4}\div\frac{5}{6}$	**11.** $640\overline{)2,400}$
(8)	(10)	(11)
4. $246\overline{)18,778}$	**8.** $8\frac{1}{3}\div3\frac{8}{9}$	**12.** $.48\overline{)30.48}$
(9)	(10)	(11)

V. Percentage

1. (8) $66\frac{2}{3}\%$ of 360 =
2. (8) 4% of \$750 =
3. (8) $3\frac{1}{2}\%$ of \$180 =
4. (8) 27 = (?)% of 36
5. (8) 98 = 25% of (?)
6. (12) \$250 increased 12% =
7. (12) \$120 decreased 15% =
8. (12) 48 = 75% of (?)
9. (12) 175 = $87\frac{1}{2}\%$ of (?)
10. (12) 63 = (?)% of 75

DRILL EXAMPLES

ADDITION OF LIKE FRACTIONS

1. $\frac{2}{5} + \frac{1}{5}$
2. $\frac{1}{7} + \frac{3}{7}$
3. $\frac{4}{9} + \frac{1}{9}$
4. $\frac{7}{15} + \frac{4}{15}$
5. $\frac{5}{6} + \frac{1}{6}$
6. $\frac{3}{8} + \frac{1}{8}$
7. $\frac{2}{9} + \frac{4}{9}$
8. $\frac{3}{10} + \frac{7}{10}$
9. $\frac{5}{12} + \frac{5}{12}$
10. $\frac{4}{15} + \frac{2}{15}$
11. $\frac{5}{9} + \frac{5}{9}$
12. $\frac{7}{10} + \frac{6}{10}$
13. $\frac{8}{15} + \frac{11}{15}$
14. $\frac{6}{12} + \frac{11}{12}$
15. $\frac{14}{18} + \frac{11}{18}$
16. $\frac{9}{10} + \frac{3}{10}$
17. $\frac{7}{12} + \frac{9}{12}$
18. $\frac{7}{16} + \frac{15}{16}$
19. $\frac{4}{15} + \frac{14}{15}$
20. $\frac{17}{20} + \frac{19}{20}$
21. $\frac{2}{3} + \frac{1}{3} + \frac{2}{3}$
22. $\frac{4}{5} + \frac{2}{5} + \frac{3}{5}$
23. $\frac{5}{8} + \frac{1}{8} + \frac{3}{8}$
24. $\frac{4}{10} + \frac{1}{10} + \frac{7}{10}$
25. $\frac{2}{9} + \frac{8}{9} + \frac{2}{9}$
26. $\frac{4}{15} + \frac{13}{15} + \frac{7}{15}$
27. $\frac{11}{12} + \frac{5}{12} + \frac{5}{12}$
28. $\frac{7}{18} + \frac{17}{18} + \frac{13}{18}$
29. $\frac{9}{20} + \frac{19}{20} + \frac{7}{20}$

ADDITION OF UNLIKE FRACTIONS

Group A

1. $\frac{1}{2} + \frac{1}{4}$
2. $\frac{3}{4} + \frac{1}{8}$
3. $\frac{1}{3} + \frac{1}{6}$
4. $\frac{3}{10} + \frac{2}{5}$
5. $\frac{1}{12} + \frac{5}{6}$
6. $\frac{2}{9} + \frac{5}{18}$
7. $\frac{2}{5} + \frac{4}{15}$
8. $\frac{3}{4} + \frac{1}{12}$
9. $\frac{4}{5} + \frac{3}{20}$
10. $\frac{3}{8} + \frac{5}{16}$
11. $\frac{3}{4} + \frac{5}{8}$
12. $\frac{2}{3} + \frac{5}{6}$
13. $\frac{4}{5} + \frac{9}{10}$
14. $\frac{7}{12} + \frac{5}{6}$
15. $\frac{15}{16} + \frac{3}{4}$
16. $\frac{2}{3} + \frac{11}{12}$
17. $\frac{13}{18} + \frac{5}{6}$
18. $\frac{4}{5} + \frac{17}{20}$
19. $\frac{9}{24} + \frac{5}{8}$
20. $\frac{7}{8} + \frac{15}{16}$
21. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$
22. $\frac{1}{3} + \frac{1}{6} + \frac{1}{2}$
23. $\frac{1}{2} + \frac{1}{10} + \frac{1}{5}$
24. $\frac{2}{3} + \frac{5}{6} + \frac{1}{2}$
25. $\frac{3}{4} + \frac{5}{8} + \frac{1}{2}$
26. $\frac{3}{10} + \frac{1}{2} + \frac{4}{5}$
27. $\frac{2}{3} + \frac{7}{15} + \frac{3}{5}$
28. $\frac{3}{4} + \frac{11}{20} + \frac{4}{5}$
29. $\frac{5}{6} + \frac{13}{18} + \frac{4}{9}$

Group B

1. $\frac{1}{3} + \frac{1}{2}$
2. $\frac{1}{4} + \frac{2}{3}$
3. $\frac{3}{4} + \frac{1}{5}$
4. $\frac{2}{5} + \frac{1}{2}$
5. $\frac{1}{3} + \frac{3}{5}$
6. $\frac{1}{8} + \frac{2}{3}$
7. $\frac{4}{5} + \frac{1}{6}$
8. $\frac{1}{4} + \frac{2}{5}$
9. $\frac{1}{3} + \frac{4}{5}$
10. $\frac{1}{2} + \frac{5}{9}$
11. $\frac{4}{5} + \frac{2}{3}$
12. $\frac{3}{4} + \frac{4}{5}$
13. $\frac{5}{6} + \frac{1}{5}$
14. $\frac{8}{9} + \frac{1}{2}$
15. $\frac{1}{3} + \frac{7}{8}$
16. $\frac{7}{8} + \frac{2}{3}$
17. $\frac{1}{3} + \frac{3}{4}$
18. $\frac{3}{5} + \frac{5}{6}$
19. $\frac{5}{6} + \frac{4}{5}$
20. $\frac{1}{2} + \frac{7}{9}$

Copyright, 1925, by Newson & Company.

Group C

1. $\frac{1}{4} + \frac{1}{6}$	6. $\frac{5}{9} + \frac{1}{6}$	11. $\frac{5}{6} + \frac{5}{4}$	16. $\frac{3}{4} + \frac{7}{10}$
2. $\frac{5}{6} + \frac{1}{9}$	7. $\frac{1}{4} + \frac{7}{10}$	12. $\frac{9}{10} + \frac{3}{4}$	17. $\frac{11}{12} + \frac{5}{8}$
3. $\frac{3}{10} + \frac{1}{4}$	8. $\frac{5}{12} + \frac{1}{8}$	13. $\frac{5}{8} + \frac{7}{12}$	18. $\frac{5}{6} + \frac{8}{9}$
4. $\frac{3}{8} + \frac{1}{6}$	9. $\frac{3}{8} + \frac{7}{12}$	14. $\frac{1}{6} + \frac{7}{8}$	19. $\frac{7}{8} + \frac{5}{12}$
5. $\frac{1}{6} + \frac{3}{4}$	10. $\frac{7}{9} + \frac{5}{6}$	15. $\frac{7}{8} + \frac{5}{6}$	20. $\frac{5}{6} + \frac{7}{10}$

21. $\frac{1}{4} + \frac{5}{6} + \frac{1}{2}$	24. $\frac{2}{3} + \frac{1}{4} + \frac{5}{6}$	27. $\frac{4}{5} + \frac{9}{10} + \frac{3}{4}$
22. $\frac{2}{3} + \frac{1}{6} + \frac{3}{4}$	25. $\frac{1}{4} + \frac{3}{10} + \frac{1}{2}$	28. $\frac{1}{8} + \frac{7}{12} + \frac{3}{4}$
23. $\frac{1}{2} + \frac{1}{6} + \frac{5}{9}$	26. $\frac{2}{3} + \frac{7}{9} + \frac{5}{6}$	29. $\frac{5}{8} + \frac{5}{12} + \frac{5}{6}$

ADDITION OF MIXED NUMBERS

Group A

1. $4\frac{1}{3}$ $\underline{8}$	6. $\frac{3}{5}$ $\underline{7\frac{1}{5}}$	11. $\frac{1}{4}$ $\underline{6\frac{1}{2}}$	16. $\frac{1}{2}$ $\underline{13\frac{7}{8}}$
2. $5\frac{1}{2}$ $\underline{9}$	7. $\frac{1}{9}$ $\underline{8\frac{4}{9}}$	12. $\frac{3}{5}$ $\underline{14\frac{3}{10}}$	17. $\frac{2}{3}$ $\underline{16\frac{5}{6}}$
3. 11 $\underline{8\frac{3}{5}}$	8. $\frac{3}{8}$ $\underline{10\frac{1}{8}}$	13. $12\frac{1}{4}$ $\underline{\frac{1}{6}}$	18. $14\frac{5}{6}$ $\underline{\frac{1}{4}}$
4. 15 $\underline{7\frac{3}{4}}$	9. $\frac{5}{12}$ $\underline{9\frac{5}{12}}$	14. $15\frac{1}{10}$ $\underline{\frac{3}{4}}$	19. $19\frac{5}{8}$ $\underline{\frac{1}{6}}$
5. $6\frac{5}{8}$ $\underline{24}$	10. $\frac{5}{6}$ $\underline{12\frac{1}{6}}$	15. $\frac{1}{5}$ $\underline{18\frac{1}{3}}$	20. $\frac{4}{5}$ $\underline{20\frac{3}{4}}$

Group B

1. $15\frac{1}{5}$ $18\frac{2}{5}$	6. $11\frac{1}{8}$ $12\frac{3}{8}$	11. $13\frac{3}{4}$ $16\frac{3}{4}$	16. $15\frac{2}{3}$ $15\frac{1}{6}$	21. $27\frac{3}{4}$ $15\frac{5}{6}$
2. $17\frac{1}{3}$ $8\frac{1}{3}$	7. $16\frac{3}{10}$ $5\frac{3}{10}$	12. $23\frac{1}{6}$ $12\frac{5}{6}$	17. $17\frac{3}{8}$ $24\frac{1}{4}$	22. $32\frac{3}{5}$ $16\frac{2}{3}$
3. $6\frac{2}{9}$ $14\frac{5}{9}$	8. $7\frac{7}{12}$ $10\frac{1}{12}$	13. $19\frac{7}{8}$ $7\frac{5}{8}$	18. $8\frac{1}{4}$ $37\frac{5}{12}$	23. $44\frac{5}{6}$ $7\frac{4}{9}$
4. $13\frac{7}{15}$ $14\frac{4}{15}$	9. $15\frac{9}{16}$ $16\frac{5}{16}$	14. $16\frac{11}{12}$ $27\frac{5}{12}$	19. $29\frac{4}{5}$ $14\frac{7}{15}$	24. $9\frac{1}{4}$ $53\frac{9}{10}$
5. $9\frac{3}{16}$ $22\frac{4}{16}$	10. $3\frac{7}{20}$ $26\frac{11}{20}$	15. $24\frac{9}{16}$ $14\frac{15}{16}$	20. $31\frac{1}{2}$ $13\frac{9}{10}$	25. $15\frac{7}{8}$ $48\frac{5}{6}$

Group C

1. $4\frac{2}{3}$ 5 $8\frac{2}{3}$	5. $12\frac{4}{5}$ $7\frac{7}{10}$ $15\frac{1}{2}$	9. $16\frac{1}{2}$ $15\frac{7}{8}$ $8\frac{3}{4}$	13. $45\frac{2}{3}$ $28\frac{3}{4}$ $18\frac{5}{6}$	17. $72\frac{5}{9}$ $59\frac{2}{3}$ $49\frac{5}{6}$
2. $7\frac{1}{4}$ $9\frac{3}{4}$ $2\frac{1}{4}$	6. $11\frac{5}{6}$ $6\frac{1}{2}$ $18\frac{2}{3}$	10. $27\frac{5}{8}$ $16\frac{1}{2}$ $19\frac{15}{16}$	14. $36\frac{3}{4}$ $11\frac{4}{5}$ $17\frac{7}{10}$	18. $68\frac{7}{10}$ $35\frac{3}{4}$ $97\frac{9}{10}$
3. $6\frac{3}{5}$ $8\frac{4}{5}$ $9\frac{3}{5}$	7. $25\frac{3}{4}$ $\frac{11}{12}$ $49\frac{5}{6}$	11. $32\frac{7}{9}$ $9\frac{13}{18}$ $53\frac{1}{6}$	15. $19\frac{5}{9}$ $46\frac{2}{3}$ $39\frac{5}{6}$	19. $94\frac{2}{3}$ $88\frac{3}{4}$ $99\frac{1}{8}$
4. $8\frac{5}{8}$ $7\frac{1}{8}$ $9\frac{7}{8}$	8. $32\frac{2}{3}$ $14\frac{14}{15}$ $26\frac{3}{5}$	12. $24\frac{9}{10}$ $39\frac{17}{20}$ $29\frac{3}{4}$	16. $58\frac{7}{9}$ $15\frac{1}{2}$ $37\frac{8}{9}$	20. $79\frac{1}{4}$ $87\frac{5}{8}$ $98\frac{5}{6}$

SUBTRACTION OF LIKE FRACTIONS

1. $\frac{4}{5} - \frac{2}{5}$
2. $\frac{7}{8} - \frac{4}{8}$
3. $\frac{8}{9} - \frac{4}{9}$
4. $\frac{9}{10} - \frac{2}{10}$
5. $\frac{11}{12} - \frac{6}{12}$
6. $\frac{5}{8} - \frac{1}{8}$
7. $\frac{7}{9} - \frac{4}{9}$
8. $\frac{11}{12} - \frac{7}{12}$
9. $\frac{9}{10} - \frac{7}{10}$
10. $\frac{8}{15} - \frac{2}{15}$
11. $\frac{8}{9} - \frac{2}{9}$
12. $\frac{11}{16} - \frac{5}{16}$
13. $\frac{9}{20} - \frac{1}{20}$
14. $\frac{14}{15} - \frac{2}{15}$
15. $\frac{9}{10} - \frac{3}{10}$
16. $\frac{15}{16} - \frac{3}{16}$
17. $\frac{10}{12} - \frac{1}{12}$
18. $\frac{17}{18} - \frac{7}{18}$
19. $\frac{13}{16} - \frac{7}{16}$
20. $\frac{19}{20} - \frac{3}{20}$

SUBTRACTION OF UNLIKE FRACTIONS

Group A

1. $\frac{5}{8} - \frac{1}{2}$
2. $\frac{5}{6} - \frac{1}{3}$
3. $\frac{7}{8} - \frac{1}{4}$
4. $\frac{7}{10} - \frac{1}{2}$
5. $\frac{2}{3} - \frac{1}{12}$
6. $\frac{4}{5} - \frac{2}{15}$
7. $\frac{11}{12} - \frac{5}{6}$
8. $\frac{7}{8} - \frac{3}{16}$
9. $\frac{14}{15} - \frac{2}{3}$
10. $\frac{3}{4} - \frac{1}{16}$
11. $\frac{9}{10} - \frac{2}{5}$
12. $\frac{17}{20} - \frac{3}{4}$
13. $\frac{9}{16} - \frac{1}{8}$
14. $\frac{11}{15} - \frac{1}{5}$
15. $\frac{8}{9} - \frac{1}{18}$
16. $\frac{3}{4} - \frac{7}{12}$
17. $\frac{9}{10} - \frac{3}{20}$
18. $\frac{23}{24} - \frac{1}{8}$
19. $\frac{13}{16} - \frac{5}{8}$
20. $\frac{2}{3} - \frac{1}{24}$

Group B

1. $\frac{2}{3} - \frac{1}{2}$
2. $\frac{1}{2} - \frac{1}{5}$
3. $\frac{3}{4} - \frac{1}{5}$
4. $\frac{4}{5} - \frac{1}{3}$
5. $\frac{2}{3} - \frac{1}{4}$
6. $\frac{7}{9} - \frac{1}{2}$
7. $\frac{4}{5} - \frac{1}{4}$
8. $\frac{1}{2} - \frac{1}{3}$
9. $\frac{4}{5} - \frac{3}{4}$
10. $\frac{8}{9} - \frac{1}{2}$
11. $\frac{5}{8} - \frac{1}{3}$
12. $\frac{3}{5} - \frac{1}{2}$
13. $\frac{7}{8} - \frac{2}{3}$
14. $\frac{1}{2} - \frac{2}{5}$
15. $\frac{2}{3} - \frac{1}{5}$
16. $\frac{2}{3} - \frac{1}{8}$
17. $\frac{1}{2} - \frac{2}{9}$
18. $\frac{3}{5} - \frac{1}{6}$
19. $\frac{9}{10} - \frac{2}{3}$
20. $\frac{5}{6} - \frac{2}{5}$

Group C

1. $\frac{1}{4} - \frac{1}{6}$
2. $\frac{1}{4} - \frac{1}{10}$
3. $\frac{5}{6} - \frac{1}{4}$
4. $\frac{1}{6} - \frac{1}{9}$
5. $\frac{1}{6} - \frac{1}{8}$
6. $\frac{3}{8} - \frac{1}{6}$
7. $\frac{3}{10} - \frac{1}{4}$
8. $\frac{4}{9} - \frac{1}{6}$
9. $\frac{5}{6} - \frac{3}{4}$
10. $\frac{7}{8} - \frac{5}{6}$
11. $\frac{7}{12} - \frac{3}{8}$
12. $\frac{7}{8} - \frac{1}{6}$
13. $\frac{3}{4} - \frac{3}{10}$
14. $\frac{5}{6} - \frac{4}{9}$
15. $\frac{5}{6} - \frac{3}{8}$
16. $\frac{11}{12} - \frac{1}{8}$
17. $\frac{9}{10} - \frac{3}{4}$
18. $\frac{8}{9} - \frac{5}{6}$
19. $\frac{7}{10} - \frac{1}{4}$
20. $\frac{7}{9} - \frac{1}{6}$

SUBTRACTION WITH MIXED NUMBERS

Group A

1. $10\frac{2}{3}$	**5.** $12\frac{5}{12}$	**9.** $7\frac{3}{5}$	**13.** $9\frac{3}{4}$	**17.** $15\frac{9}{10}$
$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{3}{10}$
2. $9\frac{4}{5}$	**6.** $16\frac{3}{4}$	**10.** $15\frac{2}{3}$	**14.** $6\frac{5}{8}$	**18.** $21\frac{7}{9}$
$\frac{1}{5}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{5}{18}$
3. $11\frac{3}{4}$	**7.** $8\frac{7}{10}$	**11.** $17\frac{4}{5}$	**15.** $20\frac{9}{10}$	**19.** $36\frac{5}{6}$
$\frac{1}{4}$	$\frac{2}{5}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{5}$
4. $15\frac{7}{8}$	**8.** $14\frac{2}{3}$	**12.** $18\frac{7}{9}$	**16.** $19\frac{5}{6}$	**20.** $25\frac{7}{8}$
$\frac{1}{8}$	$\frac{2}{9}$	$\frac{1}{2}$	$\frac{2}{9}$	$\frac{5}{12}$

Group B

1. 5	**5.** 10	**9.** 11	**13.** 19	**17.** 32
$1\frac{1}{2}$	$7\frac{2}{3}$	$2\frac{3}{8}$	$10\frac{5}{12}$	$8\frac{9}{16}$
2. 8	**6.** 6	**10.** 13	**14.** 17	**18.** 27
$3\frac{1}{3}$	$1\frac{3}{4}$	$8\frac{5}{6}$	$3\frac{7}{8}$	$14\frac{11}{20}$
3. 9	**7.** 15	**11.** 18	**15.** 21	**19.** 30
$2\frac{1}{4}$	$8\frac{4}{5}$	$7\frac{4}{9}$	$6\frac{1}{10}$	$23\frac{5}{18}$
4. 7	**8.** 12	**12.** 20	**16.** 25	**20.** 28
$5\frac{1}{5}$	$4\frac{1}{6}$	$12\frac{7}{10}$	$9\frac{7}{9}$	$16\frac{7}{20}$

Group C

1. $10\frac{4}{5}$	**2.** $8\frac{5}{6}$	**3.** $11\frac{7}{8}$	**4.** $15\frac{8}{9}$	**5.** $17\frac{11}{12}$
$6\frac{1}{5}$	$2\frac{1}{6}$	$4\frac{3}{8}$	$9\frac{2}{9}$	$8\frac{7}{12}$

6. $16\frac{3}{4}$ $11\frac{1}{8}$	10. $19\frac{3}{4}$ $14\frac{1}{10}$	14. $32\frac{1}{6}$ $14\frac{2}{3}$	18. $41\frac{3}{4}$ $23\frac{9}{10}$	22. $48\frac{5}{6}$ $28\frac{7}{8}$
7. $21\frac{5}{6}$ $7\frac{2}{3}$	11. $28\frac{1}{3}$ $7\frac{2}{3}$	15. $22\frac{3}{8}$ $17\frac{9}{16}$	19. $35\frac{2}{9}$ $28\frac{5}{6}$	23. $53\frac{3}{10}$ $19\frac{3}{4}$
8. $23\frac{5}{6}$ $15\frac{3}{4}$	12. $31\frac{2}{9}$ $8\frac{7}{9}$	16. $25\frac{1}{6}$ $13\frac{3}{4}$	20. $44\frac{1}{6}$ $27\frac{3}{8}$	24. $42\frac{5}{12}$ $33\frac{7}{8}$
9. $20\frac{4}{5}$ $9\frac{1}{3}$	13. $26\frac{2}{5}$ $17\frac{4}{5}$	17. $36\frac{1}{2}$ $18\frac{7}{9}$	21. $51\frac{1}{4}$ $34\frac{4}{5}$	25. $56\frac{1}{6}$ $37\frac{4}{5}$

MULTIPLICATION OF FRACTIONS

Group A

1. $\frac{1}{2} \times \frac{1}{4}$	6. $\frac{1}{2} \times \frac{3}{4}$	11. $\frac{1}{2} \times \frac{4}{5}$	16. $\frac{5}{12} \times \frac{4}{5}$
2. $\frac{1}{3} \times \frac{1}{5}$	7. $\frac{2}{3} \times \frac{1}{3}$	12. $\frac{3}{4} \times \frac{5}{6}$	17. $\frac{9}{20} \times \frac{5}{6}$
3. $\frac{1}{5} \times \frac{1}{2}$	8. $\frac{1}{3} \times \frac{4}{5}$	13. $\frac{4}{5} \times \frac{5}{8}$	18. $\frac{3}{4} \times \frac{8}{15}$
4. $\frac{1}{3} \times \frac{1}{8}$	9. $\frac{3}{5} \times \frac{1}{2}$	14. $\frac{2}{3} \times \frac{3}{8}$	19. $\frac{6}{10} \times \frac{15}{16}$
5. $\frac{1}{4} \times \frac{1}{5}$	10. $\frac{1}{4} \times \frac{5}{6}$	15. $\frac{3}{4} \times \frac{2}{9}$	20. $\frac{14}{15} \times \frac{5}{12}$

Group B

1. $\frac{4}{3} \times \frac{2}{5}$	6. $\frac{8}{3} \times \frac{3}{4}$	11. $\frac{1}{2} \times 2\frac{1}{3}$	16. $\frac{2}{5} \times 3\frac{3}{4}$
2. $\frac{3}{2} \times \frac{5}{8}$	7. $\frac{9}{4} \times \frac{7}{6}$	12. $\frac{2}{3} \times 1\frac{4}{5}$	17. $\frac{3}{4} \times 1\frac{5}{9}$
3. $\frac{5}{4} \times \frac{3}{2}$	8. $\frac{6}{5} \times \frac{3}{2}$	13. $3\frac{1}{3} \times \frac{7}{8}$	18. $3\frac{3}{4} \times \frac{8}{9}$
4. $\frac{7}{3} \times \frac{4}{3}$	9. $\frac{15}{8} \times \frac{6}{5}$	14. $\frac{5}{6} \times 3\frac{2}{3}$	19. $\frac{7}{8} \times 3\frac{1}{5}$
5. $\frac{9}{5} \times \frac{7}{4}$	10. $\frac{10}{9} \times \frac{21}{15}$	15. $7\frac{1}{2} \times \frac{3}{4}$	20. $2\frac{1}{10} \times \frac{5}{18}$

Group C

1. $3 \times \frac{4}{5}$
2. $4 \times \frac{2}{3}$
3. $5 \times \frac{5}{9}$
4. $7 \times \frac{3}{4}$
5. $11 \times \frac{5}{6}$
6. $4 \times \frac{5}{8}$
7. $8 \times \frac{7}{12}$
8. $\frac{7}{9} \times 6$
9. $14 \times \frac{9}{16}$
10. $\frac{9}{10} \times 15$
11. $5 \times 1\frac{3}{4}$
12. $1\frac{1}{2} \times 7$
13. $9 \times 2\frac{1}{5}$
14. $2 \times \frac{2}{9}3$
15. $3\frac{5}{6} \times 5$
16. $3\frac{2}{3} \times 9$
17. $6 \times 2\frac{1}{4}$
18. $2\frac{5}{6} \times 8$
19. $16 \times 1\frac{5}{12}$
20. $2\frac{3}{10} \times 12$

Group D

1. $1\frac{1}{4} \times 1\frac{1}{2}$
2. $1\frac{2}{5} \times 2\frac{1}{4}$
3. $1\frac{1}{8} \times 1\frac{1}{2}$
4. $1\frac{1}{3} \times 1\frac{1}{3}$
5. $2\frac{1}{3} \times 1\frac{7}{8}$
6. $1\frac{1}{3} \times 1\frac{3}{8}$
7. $1\frac{1}{2} \times 3\frac{1}{3}$
8. $1\frac{1}{5} \times 1\frac{7}{8}$
9. $4\frac{1}{2} \times 4\frac{2}{3}$
10. $6\frac{2}{3} \times 4\frac{1}{5}$
11. $1\frac{3}{5} \times 4\frac{1}{6}$
12. $3\frac{1}{8} \times 1\frac{1}{5}$
13. $2\frac{2}{9} \times 5\frac{1}{10}$
14. $5\frac{1}{4} \times 1\frac{7}{9}$
15. $3\frac{3}{4} \times 8\frac{2}{3}$
16. $3\frac{1}{8} \times 3\frac{1}{5}$
17. $4\frac{1}{8} \times 4\frac{8}{9}$
18. $8\frac{4}{5} \times 2\frac{11}{12}$
19. $5\frac{5}{6} \times 1\frac{7}{8}$
20. $1\frac{11}{16} \times 3\frac{1}{9}$

Group E

1. $\frac{2}{3} \times \frac{3}{4} \times \frac{8}{9}$
2. $\frac{4}{5} \times 10 \times \frac{1}{6}$
3. $\frac{5}{12} \times 3 \times \frac{8}{15}$
4. $\frac{9}{10} \times \frac{5}{6} \times \frac{3}{4}$
5. $\frac{7}{8} \times \frac{4}{9} \times \frac{3}{5}$
6. $\frac{8}{9} \times 6 \times \frac{15}{16}$
7. $\frac{4}{3} \times \frac{9}{10} \times \frac{5}{12}$
8. $\frac{6}{5} \times \frac{1}{12} \times \frac{15}{8}$
9. $\frac{3}{8} \times 12 \times 1\frac{5}{9}$
10. $\frac{14}{15} \times 1\frac{1}{4} \times \frac{3}{4}$
11. $\frac{2}{3} \times 2\frac{2}{5} \times \frac{5}{6}$
12. $1\frac{7}{8} \times 6 \times \frac{3}{10}$
13. $3\frac{3}{4} \times 1\frac{1}{5} \times 2\frac{2}{3}$
14. $4\frac{1}{6} \times 8 \times 1\frac{1}{20}$
15. $2\frac{2}{3} \times 1\frac{1}{5} \times 2\frac{3}{16}$

DIVISION OF FRACTIONS

Group A

1. $5 \div \frac{1}{3}$
2. $3 \div \frac{1}{4}$
3. $4 \div \frac{1}{6}$
4. $7 \div \frac{1}{5}$
5. $3 \div \frac{2}{3}$
6. $4 \div \frac{5}{6}$
7. $5 \div \frac{4}{9}$
8. $8 \div \frac{3}{5}$
9. $10 \div \frac{5}{8}$
10. $12 \div \frac{8}{15}$
11. $6 \div \frac{4}{5}$
12. $12 \div \frac{9}{20}$
13. $9 \div \frac{6}{5}$
14. $4 \div \frac{8}{3}$
15. $15 \div \frac{10}{9}$
16. $18 \div \frac{15}{8}$

Group B

1. $\frac{1}{3} \div \frac{1}{2}$
2. $\frac{1}{8} \div \frac{1}{4}$
3. $\frac{1}{3} \div \frac{1}{6}$
4. $\frac{1}{12} \div \frac{1}{4}$
5. $\frac{1}{2} \div \frac{2}{5}$
6. $\frac{1}{3} \div \frac{2}{3}$
7. $\frac{1}{10} \div \frac{2}{5}$
8. $\frac{1}{8} \div \frac{5}{6}$
9. $\frac{1}{6} \div \frac{3}{8}$
10. $\frac{1}{4} \div \frac{3}{20}$
11. $\frac{1}{12} \div \frac{5}{8}$
12. $\frac{1}{9} \div \frac{5}{12}$
13. $\frac{1}{8} \div \frac{9}{4}$
14. $\frac{1}{4} \div \frac{9}{8}$
15. $\frac{1}{6} \div \frac{10}{3}$
16. $\frac{1}{5} \div \frac{16}{15}$

Group C

1. $\frac{3}{4} \div \frac{1}{2}$
2. $\frac{4}{5} \div \frac{1}{3}$
3. $\frac{5}{8} \div \frac{1}{6}$
4. $\frac{7}{9} \div \frac{1}{12}$
5. $\frac{3}{5} \div \frac{2}{3}$
6. $\frac{4}{9} \div \frac{3}{5}$
7. $\frac{2}{3} \div \frac{3}{10}$
8. $\frac{3}{8} \div \frac{4}{5}$
9. $\frac{3}{4} \div \frac{5}{6}$
10. $\frac{9}{10} \div \frac{3}{8}$
11. $\frac{8}{9} \div \frac{5}{12}$
12. $\frac{15}{16} \div \frac{3}{4}$
13. $\frac{9}{10} \div \frac{6}{5}$
14. $\frac{8}{15} \div \frac{12}{5}$
15. $\frac{7}{12} \div \frac{9}{8}$
16. $\frac{4}{9} \div \frac{16}{15}$

Group D

1. $\frac{7}{5} \div \frac{1}{3}$
2. $\frac{4}{3} \div \frac{1}{2}$
3. $1\frac{3}{4} \div \frac{1}{6}$
4. $2\frac{2}{5} \div \frac{1}{10}$
5. $\frac{6}{5} \div \frac{4}{5}$
6. $\frac{7}{3} \div \frac{5}{6}$
7. $\frac{10}{9} \div \frac{5}{12}$
8. $\frac{15}{8} \div \frac{3}{4}$
9. $1\frac{3}{8} \div \frac{3}{4}$
10. $3\frac{3}{4} \div \frac{3}{8}$
11. $2\frac{2}{5} \div \frac{8}{15}$
12. $4\frac{2}{3} \div \frac{8}{9}$
13. $\frac{9}{8} \div \frac{5}{4}$
14. $1\frac{6}{5} \div \frac{5}{8}$
15. $13\frac{1}{2} \div \frac{15}{4}$
16. $8\frac{1}{3} \div \frac{10}{9}$

Group E

1. $\frac{1}{2} \div 5$
2. $\frac{1}{3} \div 7$
3. $\frac{1}{4} \div 4$
4. $\frac{1}{6} \div 2$
5. $\frac{4}{9} \div 8$
6. $\frac{3}{4} \div 6$
7. $\frac{8}{9} \div 4$
8. $\frac{9}{10} \div 12$
9. $\frac{5}{3} \div 10$
10. $\frac{10}{9} \div 4$
11. $\frac{8}{3} \div 6$
12. $\frac{15}{8} \div 9$
13. $6\frac{1}{4} \div 5$
14. $2\frac{2}{9} \div 8$
15. $6\frac{3}{5} \div 11$
16. $3\frac{3}{8} \div 18$

Group F

1. $\frac{1}{6} \div 1\frac{2}{3}$
2. $\frac{1}{4} \div 1\frac{1}{8}$
3. $\frac{8}{15} \div 2\frac{2}{5}$
4. $1\frac{4}{3} \div 2\frac{2}{9}$
5. $1\frac{1}{9} \div 1\frac{7}{15}$
6. $4 \div 1\frac{1}{5}$
7. $6 \div 1\frac{1}{7}$
8. $12 \div 5\frac{1}{3}$
9. $15 \div 3\frac{3}{5}$
10. $16 \div 13\frac{1}{3}$
11. $3\frac{1}{2} \div 2\frac{1}{4}$
12. $5\frac{1}{3} \div 1\frac{3}{5}$
13. $6\frac{1}{4} \div 1\frac{1}{8}$
14. $2\frac{7}{10} \div 7\frac{1}{2}$
15. $2\frac{4}{5} \div 1\frac{1}{15}$
16. $6\frac{3}{8} \div 2\frac{5}{6}$
17. $2\frac{2}{15} \div 6\frac{2}{3}$
18. $5\frac{5}{6} \div 1\frac{7}{8}$
19. $8\frac{1}{4} \div 4\frac{1}{2}$
20. $2\frac{5}{8} \div 8\frac{1}{6}$

ADDITION OF DECIMALS

1.	2.	3.	4.	5.
3.48	28.16	83.57	5.783	45.68
9.65	7.89	45.02	9.63	7.39
4.93	19.35	68.94	.948	78.92
8.79	6.92	97.37	4.857	.86
5.06	53.17	79.68	.37	9.47
9.58	9.86	89.73	8.596	92.88
7.95	85.93	58.89	8.76	7.95
4.89	7.49	96.52	9.919	5.68

6.	7.	8.	9.
5.078	57.36	8.759	97.45
.9637	9.87	47.07	6.985
9.848	784.09	8.195	.70
.586	98.9	89.08	49.092
8.795	9.75	72.969	98.963
.0979	86.94	.75	38.798
8.9598	509.89	9.898	9.879
9.982	97.58	95.67	85.986

SUBTRACTION OF DECIMALS

1.	4.	7.	10.
78.5	93.7	70.06	80.
36.2	27.61	58.79	29.59

2.	5.	8.	11.
91.3	60.2	81.7	6.278
78.9	47.8	54.29	1.429

3.	6.	9.	12.
54.76	45.07	62.4	3.402
18.3	26.81	18.69	2.797

13. 8.503 2.489	**15.** 9.4 1.567	**17.** 633.2 589.71	**19.** 600. 357.99
14. 7.06 3.892	**16.** 520.03 495.05	**18.** 75.76 55.988	**20.** 80. 26.495

MULTIPLICATION OF DECIMALS

Group A

1. 12×16.4	**9.** $26 \times .78$	**17.** 64×8.974
2. 16×19.5	**10.** $68 \times .95$	**18.** 96×9.095
3. 30×27.2	**11.** 97×8.19	**19.** $483 \times .079$
4. 40×31.5	**12.** $286 \times .58$	**20.** 906×4.05
5. 27×48.7	**13.** $794 \times .85$	**21.** 897×9.93
6. 39×29.4	**14.** 78×59.75	**22.** $460 \times .509$
7. 58×4.65	**15.** 95×87.96	**23.** 7800×8.045
8. 49×9.82	**16.** $4978 \times .69$	**24.** $9400 \times .0085$

Group B

1. 4.7×6.8	**11.** 7.62×18.3	**21.** 4.6×53.85
2. 9.3×2.6	**12.** 9.36×8.25	**22.** 8.7×40.69
3. 6.4×8.5	**13.** 80.4×60.5	**23.** 9.5×88.96
4. 7.9×9.2	**14.** 3.98×94.6	**24.** 7.8×9.605
5. 7.5×8.6	**15.** 96.4×8.75	**25.** $.59 \times 780.3$
6. 4.8×7.29	**16.** 5.08×40.6	**26.** 47.6×309.5
7. 5.6×8.95	**17.** $.625 \times 15.2$	**27.** 68.5×987.8
8. 9.2×5.36	**18.** $89.5 \times .076$	**28.** $.964 \times 79.75$
9. 8.7×49.7	**19.** 76.8×49.3	**29.** 469.8×16.94
10. 6.4×90.8	**20.** $.536 \times 9.85$	**30.** $.0492 \times 98.75$

DIVISION OF DECIMALS

Group A

1. 445.2 ÷ 53	**13.** 8037 ÷ 94	**25.** 1964.6 ÷ 517
2. 329.8 ÷ 34	**14.** 3708.8 ÷ 38	**26.** 5821.8 ÷ 626
3. 731.5 ÷ 77	**15.** 121.32 ÷ 18	**27.** 3861 ÷ 495
4. 226.2 ÷ 29	**16.** 356.58 ÷ 42	**28.** 4471 ÷ 526
5. 1255.8 ÷ 23	**17.** 206.18 ÷ 26	**29.** 2520 ÷ 450
6. 1818.9 ÷ 47	**18.** 521.1 ÷ 54	**30.** 8980.4 ÷ 628
7. 5220 ÷ 75	**19.** 169.46 ÷ 37	**31.** 1822.13 ÷ 709
8. 4673.6 ÷ 92	**20.** 506.6 ÷ 85	**32.** 6686.4 ÷ 398
9. 8032.4 ÷ 86	**21.** 590.57 ÷ 73	**33.** 4133.77 ÷ 863
10. 4877.4 ÷ 66	**22.** 530.64 ÷ 67	**34.** 48763 ÷ 605
11. 3979.2 ÷ 48	**23.** 752.4 ÷ 132	**35.** 8224.8 ÷ 920
12. 4088.7 ÷ 59	**24.** 2976 ÷ 465	**36.** 7297.81 ÷ 769

Group B

1. 37.41 ÷ 4.3	**13.** 325.71 ÷ .77	**25.** 339.3 ÷ 34.8
2. 54.88 ÷ 5.6	**14.** 35.136 ÷ .64	**26.** 347.011 ÷ 5.57
3. 29.64 ÷ .39	**15.** 3.4055 ÷ .49	**27.** 816.127 ÷ 87.1
4. 817.8 ÷ 8.7	**16.** 7.8213 ÷ .87	**28.** 62.1588 ÷ .748
5. 539 ÷ 9.8	**17.** 486 ÷ .75	**29.** 34.8058 ÷ 49.3
6. 40.67 ÷ 4.9	**18.** .5472 ÷ 9.6	**30.** 772.24 ÷ 7.84
7. 51 ÷ .68	**19.** 6.1422 ÷ 8.7	**31.** 567 ÷ .875
8. 37.24 ÷ 7.6	**20.** 36.135 ÷ .73	**32.** 913.962 ÷ 92.6
9. 435 ÷ .58	**21.** 48.921 ÷ .69	**33.** 41050.3 ÷ 85.7
10. 35.04 ÷ 2.4	**22.** 478.8 ÷ 5.6	**34.** 4.5849 ÷ .986
11. 10.989 ÷ 3.7	**23.** 320.95 ÷ 3.5	**35.** 31.4112 ÷ 40.9
12. 42.21 ÷ 4.5	**24.** 184.032 ÷ 21.6	**36.** 8057.64 ÷ 9.96

Group C. Find quotients to two decimal places.

1. $46.9 \div 25$
2. $78.3 \div 36$
3. $97.5 \div 78$
4. $191.1 \div 26$
5. $567.3 \div 94$
6. $602.4 \div 57$
7. $666 \div 68$
8. $1119 \div 39$
9. $1527.1 \div 97$
10. $48.64 \div 75$
11. $875.7 \div 46$
12. $59.28 \div 8.5$
13. $4.092 \div .56$
14. $91.53 \div 6.9$
15. $3.05 \div .78$
16. $60.73 \div .47$
17. $876 \div 54.3$
18. $1073 \div 88.2$
19. $7.02 \div 62.1$
20. $5.9 \div 58.6$
21. $35.05 \div 71.8$
22. $58.99 \div 69.4$
23. $2.09 \div 9.37$
24. $8 \div 1.48$

CHANGING COMMON FRACTIONS TO DECIMAL FRACTIONS

Carry results to not more than three decimal places.

1. $\frac{5}{7}$
2. $\frac{7}{9}$
3. $\frac{4}{11}$
4. $\frac{8}{25}$
5. $\frac{47}{50}$
6. $\frac{19}{20}$
7. $\frac{1}{15}$
8. $\frac{3}{35}$
9. $\frac{31}{45}$
10. $\frac{2}{19}$
11. $\frac{8}{150}$
12. $\frac{7}{125}$
13. $\frac{4}{340}$
14. $\frac{5}{136}$
15. $\frac{9}{700}$

PERCENTAGE

Find:

1. 8% of 150
2. 15% of 240
3. 30% of 600
4. 28% of 75
5. 16% of 105
6. 35% of 87
7. 62% of 225
8. 83% of 97
9. 98% of 498
10. 96% of 975
11. $4\frac{1}{2}$% of 164
12. $6\frac{1}{2}$% of 560
13. 105% of 940
14. 125% of 948
15. $5\frac{1}{2}$% of 420
16. $10\frac{1}{2}$% of 890
17. $8\frac{1}{3}$% of 180
18. 165% of 894
19. $9\frac{1}{2}$% of 648
20. 138% of 989
21. 89% of 560 lb.
22. 187% of 790 ft.
23. $8\frac{1}{2}$% of \$850
24. 78% of 980 gal.
25. 139% of 860 mi.
26. 86% of \$12.50
27. $7\frac{1}{2}$% of \$580
28. 175% of \$1800
29. $9\frac{1}{4}$% of \$3200
30. 115% of \$8.80

DISCOUNT

Find the selling prices with these list prices and rates of discount given.

1. \$95, 8%
2. \$130, 6%
3. \$250, 12%
4. \$8.50, 16%
5. \$940, 5%
6. \$675, 4%
7. \$1050, 10%
8. \$760, $12\frac{1}{2}$%
9. \$9.55, 20%
10. \$8.98, 15%
11. \$800, $4\frac{1}{2}$%
12. \$1500, 14%
13. \$97.80, $33\frac{1}{3}$%
14. \$85.50, 18%
15. \$3600, $8\frac{1}{2}$%

COMMISSION

Find the net proceeds with the following sales and rates of commission.

1. \$600, 2%
2. \$850, 4%
3. \$975, 6%
4. \$750, 3%
5. \$585, 8%
6. \$1400, 5%
7. \$1950, 2%
8. \$2700, 7%
9. \$6575, 4%
10. \$95.25, 8%
11. \$1000, $2\frac{1}{2}$%
12. \$2500, $4\frac{1}{2}$%
13. \$1800, $3\frac{1}{3}$%
14. \$3860, 5%
15. \$5000, $8\frac{1}{2}$%

Find the entire cost when these purchases and rates of commission are given.

1. \$150, 4%
2. \$600, 3%
3. \$800, 5%
4. \$950, 4%
5. \$875, 2%
6. \$1200, 6%
7. \$1500, 3%
8. \$1000, $3\frac{1}{2}$%
9. \$2400, 4%
10. \$7500, 5%
11. \$1600, $1\frac{1}{2}$%
12. \$1875, 6%
13. \$3750, 4%
14. \$4000, $2\frac{1}{4}$%
15. \$8680, $5\frac{1}{2}$%

INTEREST

Find the interest on these sums for the time and rates given.

1. \$500, 1 yr. 6 mo., 6%
2. \$800, 3 yr. 4 mo., 5%
3. \$400, 4 yr. 3 mo., 5%
4. \$240, 3 yr. 2 mo., 6%
5. \$900, 1 yr. 8 mo., 5%
6. \$640, 3 yr. 9 mo., 6%
7. \$720, 5 yr. 2 mo., 3%
8. \$810, 2 yr. 8 mo., 4%
9. \$750, 4 yr. 6 mo., 5%
10. \$360, 1 yr. 1 mo., 6%
11. \$3000, 2 yr. 5 mo., 4%
12. \$4000, 3 yr. 6 mo., $5\frac{1}{2}$%
13. \$6000, 1 yr. 9 mo., 3%
14. \$9000, 3 yr. 10 mo., 6%
15. \$1750, 4 yr. 3 mo., 4%
16. \$2000, 1 yr. 6 mo., $4\frac{1}{2}$%
17. \$8400, 1 yr. 10 mo., $3\frac{1}{2}$%
18. \$2925, 6 yr. 4 mo., 6%

FINDING RATE PER CENT

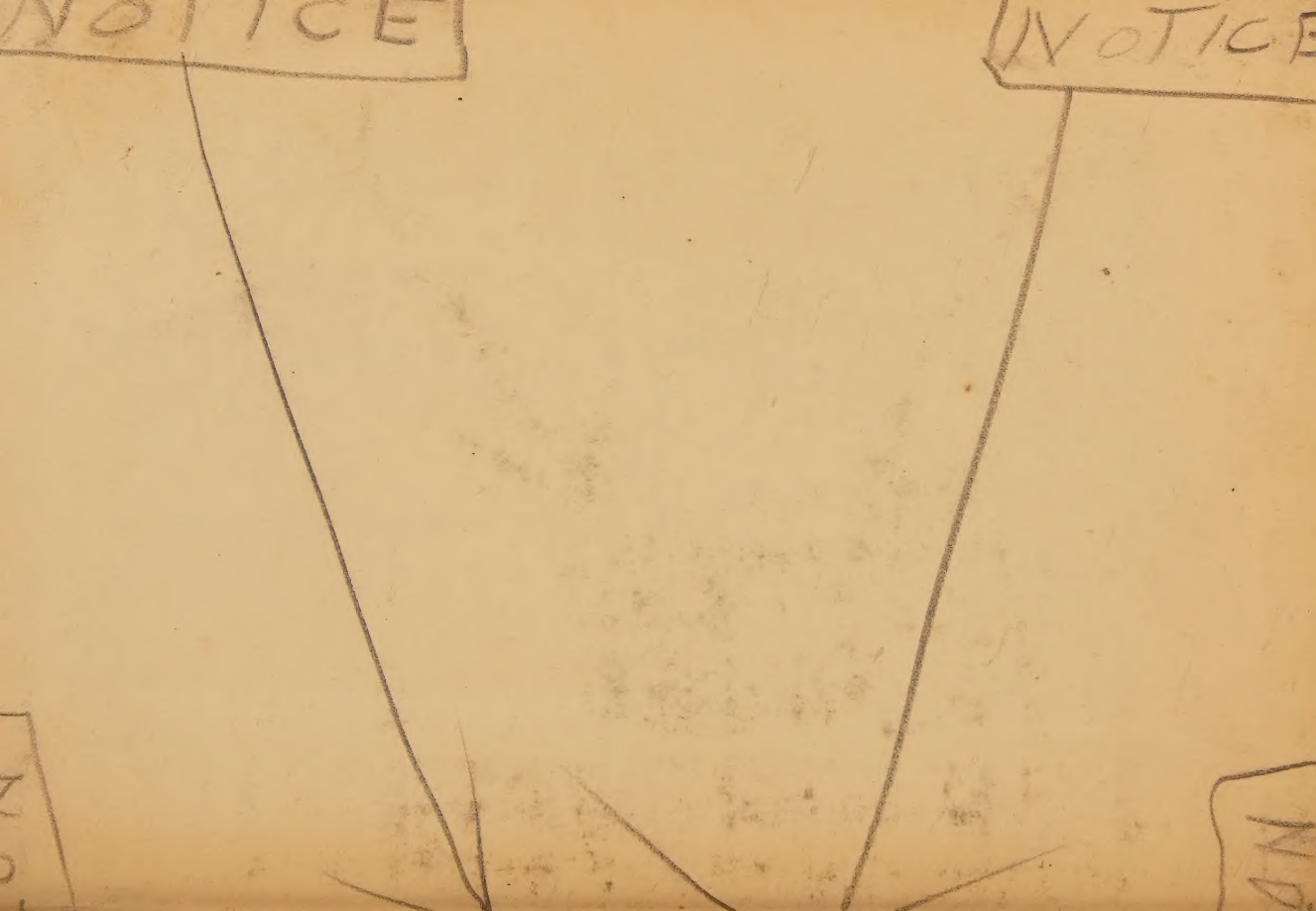
Find what per cent the first number is of the second.

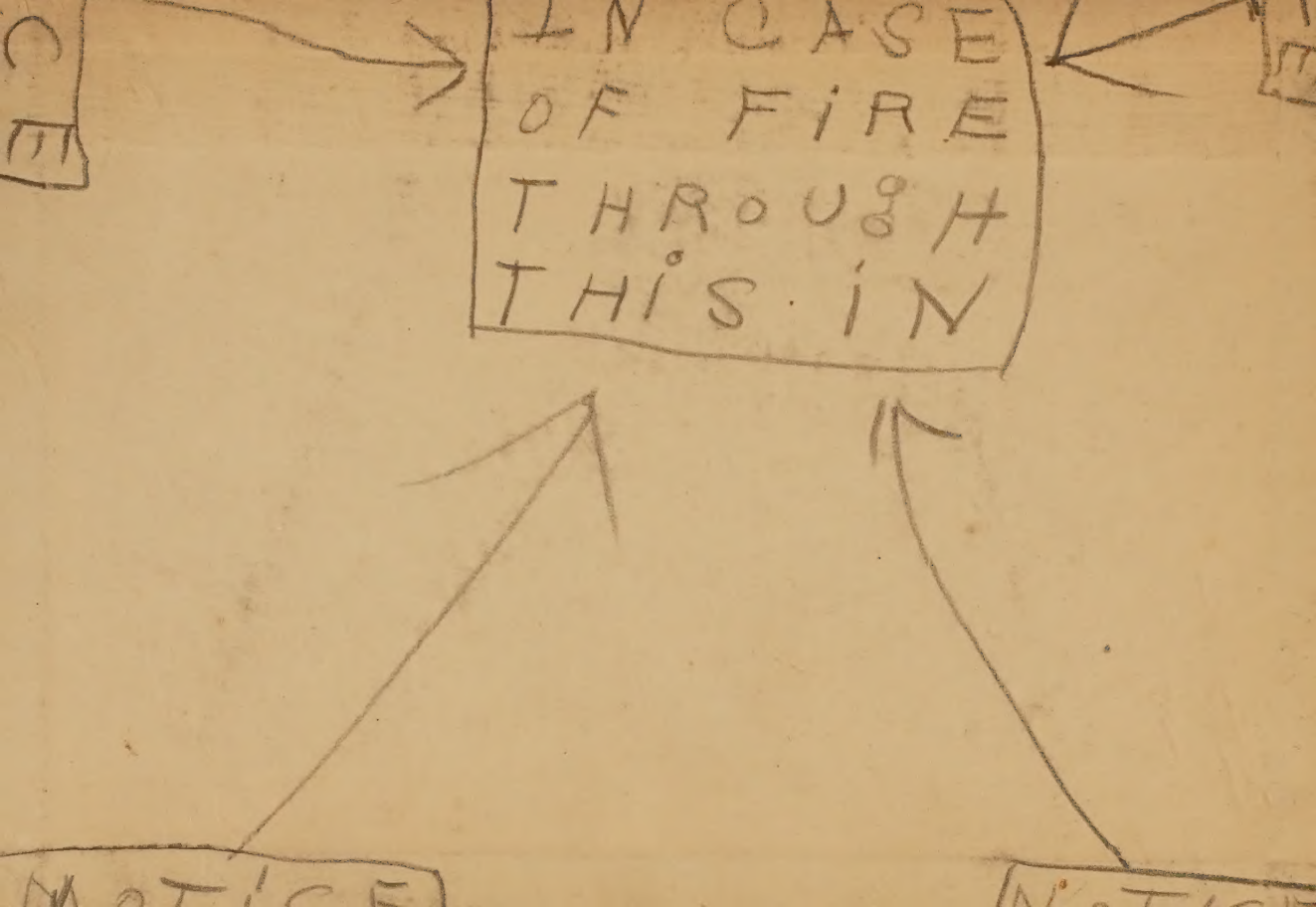
1. 18, 72
2. 19, 38
3. 45, 60
4. 54, 81
5. 27, 54
6. 24, 64
7. 64, 96
8. 60, 75
9. 15, 90
10. 90, 120
11. 54, 144
12. 72, 108
13. What % of 60 is 9?
14. What % of 50 is 17?
15. What % of 75 is 36?
16. What % of 70 is 49?
17. What % of 84 is 63?
18. What % of 120 is 42?
19. What % of 150 is 84?
20. What % of 240 is 228?
21. What % of 320 is 208?
22. 66 is what % of 60?
23. 126 is what % of 120?
24. 350 is what % of 250?
25. 4 is what % of 160?
26. 180 is what % of 320?
27. 165 is what % of 180?
28. 296 is what % of 640?
29. 303 is what % of 360?
30. 152 is what % of 256?

$$\begin{array}{r} 10 \\ 48\overline{)526} \\ 48 \\ \hline 45 \end{array} \quad \frac{15}{16}$$

$$\frac{45}{48} = \frac{15}{16}$$

$$\begin{array}{r} 16 \\ 11 \\ \hline 27 \end{array}$$


NOTICE
NOTICE


IN CASE
OF FIRE
THROUGH
THIS IN

Y0-BAR-610